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**Corporate Social Responsibility
and Firm Performances:
bridging innovation and financial outcomes to
stakeholder theory**

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Summary

This thesis aims to investigate if and how the attention towards stakeholder groups affects ability and strategy of firms and corporates on innovation and performances.

The framework of the Stakeholder Theory is assumed as reference for the origin and concept of Corporate Social Responsibility. On this basis, specific attention is dedicated to empirical studies on a database created by the research group at the University of Genoa in cooperation with the Italian Ministry of Economic Development. The data of the firms are analysed by means of clustering techniques and bivariate probit model

Results offer implications from both theoretical and practical points of views. In particular, the links between practices in Corporate Social Responsibility and corporate innovation are empirically confirmed and economically addressed, also putting into evidence how commitment in Corporate Social Responsibility initiatives increase the probability to innovate in product and in process. The results outlined in the thesis show that a holistic approach towards Corporate Social Responsibility is the key factor in order to the achieve effective performance of innovation and to foster product and process innovations. Firms are expected to implement Corporate Social Responsibility practices in all Corporate Social Responsibility areas, without neglecting any stakeholder and, in the ideal situation, the innovation outcomes and the firm performances results closely linked to the ability of firms to anticipate and meet the stakeholder needs.

Finally, beside the insights to corporate strategies, the thesis offers a methodology to support banks in the calculation of default probability of firms by exploiting the positive inter-linkage between Corporate Social Responsibility and finance and risk. Based on Basel Standards and including fields monitored through Corporate Social Responsibility indicators, the proposed approach allows understanding of corporates' capabilities to create value and demonstrate low risk of claims, fines and default.

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Overview

The present thesis is set against the background of the studies on CSR that try to identify its effect on the financial performance. The lack of consensus on results induces to consider intangible resources (e.g. innovation), in order to investigate more deeply the relationship between the two terms.

Specifically, the present work aims to contribute to the knowledge of the relationship between CSR and corporate performance through the analysis of literature review and by means of a quantitative analysis applied to manufacturing sector. The former allows identifying some critical methodological issues for which it is assumed potential paths of improvement. Among these econometric models are adopted. The analysis conducted takes as its starting point the studies investigating on the one hand the link between CSR, splitting into a set of domains inflected according to stakeholder groups, and product and process innovations; on the other hand the link between CSR, in the same previous form, and financial performance.

The structure of the thesis is as follows.

The **first chapter** describes the evolution of the concept of the CSR over the course of different periods of development of the concepts. Specifically, I focus on theoretical framework forming the basis for the social responsibility. There is no consensus about a unique definition, which encloses all concepts for CSR, and therefore several definitions are advanced depending on the institutional development, awareness about social issues and organizational behaviour. Throughout this chapter, one can see how CSR is integrating in the management sciences with new frameworks and the ties with organisational behaviour are advancing.

The **second chapter** highlights the importance of stakeholder theory into perspective as interpretative framework for tie between CSR and corporate performances in terms of financial resources, product and process innovations.

In this chapter, starting from the conceptual framework proposed at the first time in the 1960s and advanced until 1980s, several definitions of the term “stakeholder” are provided. Therefore, by fixing some essential parameters of the theory, I trace the main similarities existing between CSR concept and stakeholder view. In particular, I highlight the most important analogy between the two notions, thus the need of reconciling societal interests with those of business. Finally I present various subthemes of the CSR and the role that the stakeholder theory view plays in the discussion.

The **third chapter** reviews the quantitative researches concerning the relationships under investigation with the aim to highlight the main results reached. As far as connections existing between CSR and financial performance, from literature emerges the lack of final evidence about the improvement of the

economic performances as a result of the implementation of CSR strategies. Indeed, several papers don't reveal a positive and significant correlation between financial performance and social responsibility. In addition, the scientific community remains sceptical even about those works that report partial results, and state that socially responsible practices affect corporate performance with some limitations. The literature analysis has allowed concluding that the tie between the two parts varies depending on CSR dimensions, CSR assessment criterion, analysis context, sample under investigation and applied method.

As far as the link between CSR and innovations, the chapter develops an investigation of the fit between the two concepts through a theoretical discussion that advances a conceptual understanding of the relationship. Even then, the analysis of the literature reveals that the impact of CSR practices on innovation depends on some CSR features such as type of reaction, degree of development, and field of activity.

The **fourth chapter** defines the objectives and formalizes them in order to outline the research questions. The chapter continues with the context analysis, which leads to the development the hypotheses, tested by means of the methodologies described hereafter.

In the **fifth chapter** the results are presented and discussed. Specifically I report the measures aimed to evaluate the accuracy of the models, but also those aspects of econometric models regarding estimation and hypotheses test.

The findings reached confirm substantially the research hypotheses. Indeed, they verify that the probability of innovating in product and process increases significantly for those firms involved in CSR initiatives with broad commitment.

Again, the analysis of determinants of innovation proves the CSR domain that mostly affects the probability to innovate is related to Employees domain, confirming the conceptual arguments.

Furthermore, the results show the positive inter-linkage between Corporate Social Responsibility and finance and risk.

Finally, the **sixth chapter** presents conclusions that emerge from the interpretation of results, also with the respect to theoretical developments. The potential implications, theoretical and practical, of the present work are also explained in conjunction with limitations. In this regard, the definition of some proposals for improving future research for social responsibility are supported by: considerations expressed about the evolution of CSR in recent years; results and limits highlighted by literature analysis; and quantitative application to the selected sector support.

Chapter 1

The genesis of Corporate Social Responsibility

1.1 Introduction

The gradual reconsideration of the company nature and activity led to the recognition of the importance of the responsible management in the business conduct, both by companies and institutions, in line with the aims of the sustainable development.

The sustainable development concept was expressed for the first time in 1987, during the presentation of the report “Our common future” by Brundtland⁽²⁴⁾, president of the World Commission on Environment and Development, WCED.

The definition given 30 years ago and still accepted is the following: “Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs.” This definition holds the awareness that the natural resources are limited, therefore they have to be taken with responsibility.

Three are the fundamental components of the sustainability: economic, means the ability to generate revenue for the people's livelihoods; social, means the ability to guarantee human wealth fairly distributed for class and gender; environmental, means the ability to preserve quality and reproducibility of natural resources. The space intersecting the three components is theoretically the sustainable development.

The corporate management following this growth and development prospect observes the ways of the corporate social responsibility (CSR).

1.2 The origin of the CSR concept and its evolution in Business Practice

The expression “corporate social responsibility” was employed in so varied contexts enough to become meaningless. Therefore, now, half a century on, debate has not established a unique broadly shared definition of CSR. Several ideas and practical techniques were encompassed within the CSR research, such as corporate social performance (Carroll, 1979; Wood, 1991)⁽²⁹⁾⁽²¹⁵⁾; corporate social responsiveness (Ackerman, 1975; Sethi, 1975)⁽³⁾⁽¹⁸³⁾; corporate citizenship (Wood and Logsdon, 2001; Waddock, 2004)⁽²¹⁷⁾⁽²⁰⁶⁾; corporate governance (Jones, 1980)⁽¹¹²⁾; corporate accountability (Zadek, Pruzan, and Evans, 1997)⁽²¹⁸⁾; sustainability, triple bottom line (Elkington, 1994)⁽⁵⁸⁾; and corporate social entrepreneurship (Austin, Stevenson, and Wei-Skillern, 2006)⁽¹⁰⁾. All these ideas represent different standpoints from which one can examine the CSR concept, which was elaborated in the last fifty years. The common element to each of those is the intention to consider among the purposes of firms also social concerns besides those financial. This regards the arguments about the goals of the firm and the means to match those objectives.

Hereinafter I will expose the evolution of the CSR concept. Specifically, the attention is devoted to theoretical framework underlying the social responsibility.

Around the world, scholars, institutions and practitioners have already begun to investigate the different facets of this concept both theoretically and empirically. Enlarging the corporate responsibility from shareholder view to its all stakeholder approach leads firms to assume different roles for its different players. Shortly, the three words included in the expression CSR can be explain as follow: “Corporate”, encompasses the large range of businesses, “Social” regards the local community within which organizations operate and finally “Responsibilities”, are inherent to both terms of relationship.

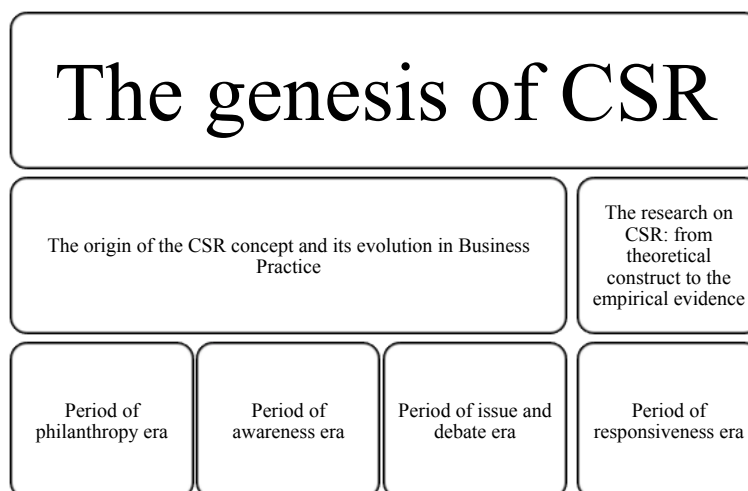


Figure 1: Classification of growth of CSR in eras.

One can uncover for centuries clues of the business community's concern for society, especially from the early 1920s. However, the theme is become very popular and was widely discussed in the literature (Bowen, 1953)⁽¹⁸⁾ over past six decades. Primarily, the discussion regarded organizations that had a social responsibility and extended the accountability of their performance.

According to CSR concept, social responsibility regards social forces, which are present in both a capitalist and socialist society. These social forces are empowered to address companies towards a path of social responsibility. Indeed, they have an enormous influence on the continued existence of companies, and believe that the company activities have a fundamental impact on the external environment, therefore imposing companies to take responsibility for greater groups than simply its shareholders.

The idea that business has some social responsibilities appears for the first time about past three hundred years ago in "The Wealth of Nations" by Scottish philosopher and economist, Adam Smith. According to Smith, though people participate in commerce or business for selfish (Invisible Hand) reasons, the society as a whole can get advantages with positive or negative externalities. Invisible hand represents the hidden instincts of human nature that drive behaviour. Yet, the invisible hand can create a spontaneous and healthy social order, if it is addressed towards adequate human institutions (Jonathan, 2007)⁽¹¹¹⁾. This means that the corporations should also improve the welfare of the society by preserving and feeding the interests of it.

The concept of business ethics or corporate philanthropy emerged in 1920s by means of concepts of public service (Smith, 1759)⁽¹⁸⁷⁾ and trusteeship (Clark, 1939)⁽⁴¹⁾. Further, in 1953 Bowen provided formally the meaning of Businessmen's social responsibilities, laying the basis for the modern concept of CSR. Furthermore, through the concept of "stewardship", Friedman (1970)⁽⁷⁹⁾ contributed to improve the Smith's thought on CSR. However, in 1980s the concept of CSR encompassed the wider concepts of social responsiveness and corporate citizenship, which referred to corporate social performance (CSP), widely examined by many authors.

Since 1980s the stakeholder theory (Freeman, 1984)⁽⁶⁹⁾ enriched the CSR concept contributing to understand the relationship between CSR and sustainable development during 1990s.

At the time, several guidelines, regulations and principles arose for implementing CSR as a best practice by corporations. As consequence, during 2000s, a new domain, called the Triple Bottom Line, was developed. This construct underlies the modern concepts of CSR as corporate citizenship and corporate stakeholder responsibility.

Bowen introduced the social responsibility concept in the academic research in 1953 during his seminal work titled: "Social Responsibilities of the Businessman".

Specifically, Bowen wondered, "What responsibilities to society may businessmen reasonably be expected to assume?" and started to define the social responsibility as "... it refers to the obligations of businessmen to pursue those

policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society". Bowen's work was based on the idea that, around that time, some hundred largest companies had a great deal of power and decision-making, and with their activities they could affect the lives of citizens in many ways, as observed also by Carroll (2006)⁽³²⁾.

Another relevant contribution to the definition of social responsibility comes from Frederick (1960)⁽⁶⁴⁾, who affirmed: "social responsibility [in the final analysis] implies a public posture toward society's economic and human resources and a willingness to see that those resources are utilized for broad social ends and not simply for the narrowly circumscribed interests of private persons and firm".

Frederick (1960)⁽⁶⁴⁾ highlights three main ideas of trusteeship and corporate philanthropy. In his idea, corporate managers have: to assume the role of public trustees, to respond to competing requests with respect to corporate resources, and, to recognize the philanthropy as the way by which business supports good causes.

According to Murphy (1978)⁽¹⁴³⁾, the 1950s represent for CSR the 'philanthropic' era, because companies essentially made charity. The decade of the 1960s witnesses the attempt to formalize the definition of CSR. Even if the most important demonstration of CSR was yet the philanthropy. Davis (1960)⁽⁵¹⁾ defined CSR as: "Businessmen's decisions and actions taken for reasons at least partially beyond the firm's direct economic or technical interest". Still, Walton (1967)⁽²⁰⁸⁾ also contributed to many aspects of CSR, by providing a new concept of social responsibility, which highlighted the interaction between the corporation and society. According to Friedman (1962)⁽⁷⁸⁾, CSR concept consisted in the social responsibility that business was supposed to take using efficiently its resources and doing activities thought to increase its profits in accordance with the rules of the game, within an open and free competition without deception or fraud. However, the expression "corporate social responsibility" came into the common use in the late 1960s and early 1970s, after the formulation of the term "stakeholder" by many multinational corporations. The term "stakeholder" was used to describe those on whom an organization's activities have an impact and, further, corporate owners beyond shareholders (Freeman, 1984)⁽⁶⁹⁾.

The decade of 1970s marked an important enlargement of the concept of CSR. Indeed, new concepts were introduced such as corporate social responsiveness (Ackerman, 1973)⁽³⁾; Ackerman and Bauer, (1976)⁽⁴⁾, and corporate social performance (CSP). In the beginning of 1970s, Friedman (1970)⁽⁷⁹⁾ stated that the social responsibility of business consists in pursuing its profits through the shareholder value maximisation, approach known as capitalism. He further expanded the capitalism themes using social responsibility concepts: "there is one and only one social responsibility of business - to use its resources and engage in activities designed to increase its profits so long as it stays within the rules of the game, which is to say, engages in open and free competition without deception or fraud."

The scholars from psychology and philosophy tried to explain CSR by means of upscale concepts. For example, Johnson (1971)⁽¹¹⁰⁾ describes CSR as typical

knowledge where “a socially responsible firm is one whose managerial staffs balance a multiplicity of interests. Instead of striving only for larger profits for its stockholders, a responsible enterprise also takes into account employees, suppliers, dealers, local communities, and the nation.” Later, Sethi (1975)⁽¹⁸³⁾ differentiates CSP, CSR and corporate behaviours by defining the “dimensions of corporate social performance”, “social obligation”, “social responsibility”, and “social responsiveness”. He further maintains that the social responsibility assures the compliance of the corporate behaviour with principal social norms, values, and performance expected. Hay and Gray (1974)⁽⁹⁹⁾ conceptually identified three historical phases of social responsibility notion: “Phase I, the profit maximize style; Phase II, the trusteeship style; and Phase III, the quality of life style. Phase III values will become more accepted by business managers of the future.”

Carroll (1979)⁽²⁹⁾ developed a conceptual model of CSP in which a four-part definition of corporate social responsibility was included.

Carroll suggests connecting three distinct aspects of CSP. The first question to which we should give an answer concerns the real our responsibility, and if it goes beyond economic and legal issues. The second question regards the social areas in which we should have responsibility (environment, product safety, discrimination, etc). Finally, we should ask us what is the right attitude for responding, reactive or proactive? According to Carroll, “for a definition of social responsibility to fully address the entire range of obligations business has to society, it must embody the economic, legal, ethical, and discretionary categories of business performance.”

The four parts framework of CSR as defined by Carroll (1979)⁽²⁹⁾ was widely adopted during this period and encompasses all duties business have toward the society: economic, legal, ethical, and discretionary. Furthermore, Carroll highlights that each responsibility is one part of the total social responsibility of business, providing a definition that fully covers the societal expectation from the business.

Though all these responsibilities there have always been together, around the time greater importance was given to economic and legal aspects rather than those ethical and discretionary. Yet, every business has economic, legal, ethical, discretionary reasons included in it. In fact, the four areas serve to categorize motives or actions as primarily one or another of these four kinds.

Economic responsibilities are the first social responsibilities of business, even if their nature is economic. Really, the business institution has a responsibility to create goods and services that society requires and to gain profit from them. All other motivations of business are based on this assumption. As regards the legal responsibilities, society expects business to satisfy its economic objectives in accordance with the law. Ethical responsibilities are among the most difficulties for business to deal with, because what is and is not ethical isn't clear defined but these types of responsibilities refer to the expectations of society that business has to fulfil over and above legal requirements. Finally, discretionary responsibilities are those assumed voluntarily, indeed the decision to take these responsibilities is driven only by business's wish to carry out social roles not mandated, not imposed

by law, and not even generally expected of businesses ethically. An example of voluntary activity is making philanthropic contributions.

In 1991, Carroll advanced his conceptual model of corporate social performance (CSP), defining specifically the discretionary component as philanthropic. Furthermore, he suggested depicting these four categories or components of CSR through a pyramid (Figure 2)

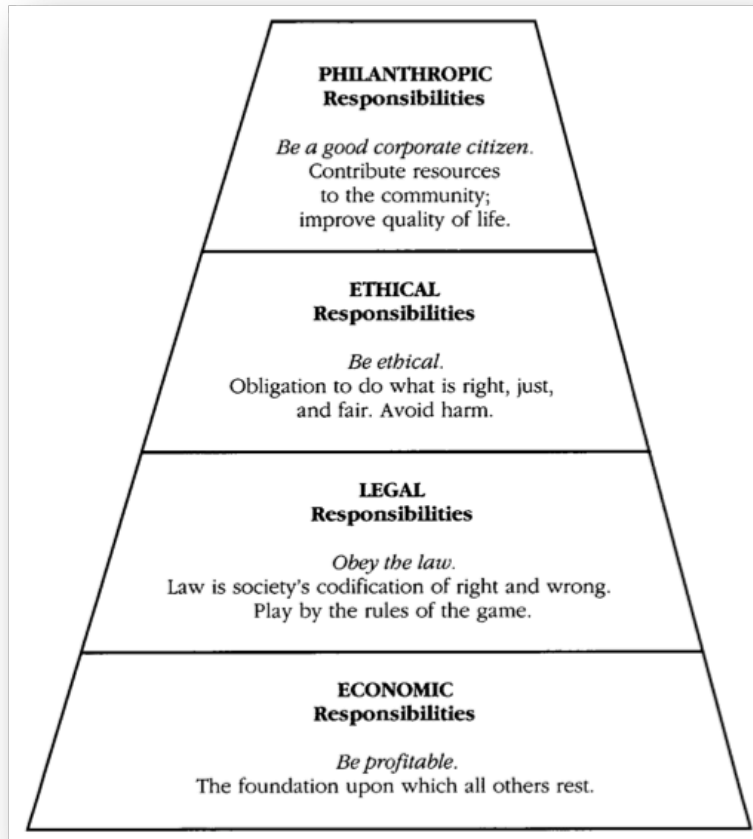


Figure 2: The Pyramid of Corporate Social Responsibility.

The pyramid illustrates four kinds of responsibility, starting from the basic building block concept that economic performance lays the foundation for all else. At the same time, business has to comply with the law because the laws codify the behaviours society accepts or doesn't accept. Next is business's ethical responsibility. This represents the duty to do what is right, avoiding to detriment of stakeholders (employees, consumers, the environment, and others). Finally, the obligation to be a good corporate citizen is enclosed in the philanthropic responsibility. In fact, concerning this component, business has to act on the financial and human resources for enhancing the quality of life for the community. According to Carroll, the components in which total CSR is separated are not mutually exclusive, and instead they have to be taken into account together without giving priority to a firm's economic responsibilities with respect to its other responsibilities. Briefly, as stated by Carroll: "the CSR firm should strive to make a profit, obey the law, be ethical, and be a good corporate citizen."

In contrast, Friedman (1970)⁽⁷⁹⁾ affirmed that the primary objective of a company is to pursue the profit. Therefore, in his view, the sole business responsibility is to enhance shareholders' wealth.

In the 1980s several themes such as corporate social responsiveness, corporate social performance, public policy, business ethics, and stakeholder theory and management contributed to redefine the core concept of the CSR.

At that time the CSR debate focused on how it could define socially responsible behaviour. Jones (1980)⁽¹¹²⁾ stated that CSR is a process, rather than a set of results. Later, Muirhead (1999)⁽¹⁴¹⁾ defined the period from the mid-1950s to mid-1980s as a period of "growth and expansion" of corporate contributions.

Further, in 1981 Tuzzolino and Armandi (1981)⁽¹⁹⁶⁾ presented a taxonomic construct to evaluate corporate performance, providing a criterion to control its social responsibility. They argued that CSR could be made operational within an organizational-need hierarchy.

During the 1980s', stakeholder theory and business ethics, by Freeman (1984)⁽⁶⁹⁾ and Wartick and Cochran (1985)⁽²⁰⁹⁾ respectively, contributed to advance the theme of CSR considerably.

In 1984 Freeman argued that: "Our current theories are inconsistent with both the quantity and kinds of change that are occurring in the business environment of the 1980s...A new conceptual framework is needed." to get through this event, he proposed a stakeholder approach to CSR, by enlarging the concept of business beyond its traditional economic basis, and defining stakeholders as those groups or individual who are influenced by or can influence the fulfilment of an organization's goals. Therefore, he considered CSR as company stakeholder responsibility, having four levels of commitment to this new CSR. Furthermore, he introduced ten principles for implementing this approach.

Wartick and Cochran (1985)⁽²⁰⁹⁾ considered social concerns management in a corporate social performance view and suggested to employ the corporate social performance model for business and society study. During this period studies exploring the relationship between CSR and firm profitability were also developed. Epstein (1987)⁽⁵⁹⁾ connected the definition of CSR with social responsibility, responsiveness, and business ethics concepts. In its view these three concepts are strongly interrelated, therefore CSR can be thought as: "CSR relates primarily to achieving outcomes from organizational decisions concerning specific issues or problems which (by some normative standard) have beneficial rather than adverse effects on pertinent corporate stakeholders. The normative correctness of the products of corporate action has been the main focus of corporate social responsibility."

In 1980s the stakeholder theory began to catch on. Unlike other theories it explained the concepts of CSR using a more holistic approach. According to this approach the relationship between a company and its stakeholders is reciprocal, that is, the stakeholders collaborate with company to fulfil their interests and, as consequence, the company acknowledges them several benefits.

The main contributions are from Freeman (1984, 1994)⁽⁶⁹⁾⁽⁷⁰⁾, Evan and Freeman (1988)⁽⁶¹⁾, Donaldson and Preston (1995)⁽⁵⁵⁾, Freeman and Phillips (2002)⁽⁷⁴⁾, Phillips et al. (2003)⁽¹⁶⁴⁾ who introduce the idea of fiduciary duties towards the stakeholders of the firm. Furthermore, this theory is related to moral theory such as Kantian, Utilitarianism, theories of justice, and so on.

Organizations like The Global Sullivan Principles and UN Global Compact think CSR regards universal rights, and it has to be figure out within the context of human rights, labour rights and respect for the environment that a company is expected to have. Several authors then used this stakeholder theory for developing some new CSR models. These are: sustainable development, stewardship theory, triple bottom line, DNA of CSR2.0 model, practitioner-based model of societal responsibilities, value creation model of CSR and consumer drive corporate responsibility. Furthermore, stakeholder theory is expanded thanks to sustainable development theory. The concept underlying the sustainable development (“development that meets the needs of the present without compromising the ability of future generations to meet their own needs”) represents the integration of innovation and conservation. In fact, innovation captures the changes, while socio-economical systems are maintained in order to preserve the eco-system.

1.3 The research on CSR: from theoretical construct to the empirical evidence

Muirhead (1999)⁽¹⁴¹⁾ called the period from the late 1980s to the 1990s as “diversification and globalization”, in the corporate contributions sense. Because, at this period, corporate philanthropy diffused significantly using the pyramid model proposed by Carroll (1991)⁽³⁰⁾ and some new models, such as triple bottom line, value creation model of CSR and the model of consumer driven corporate responsibility, began to emerge.

Around this time Davis, Schoorman and Donaldson (1997)⁽⁵²⁾ introduced the concept *stewardship*, which sees managers as “stewards” of corporate assets, by meeting interests of shareholders and stakeholders.

In contrast to the agency theory that argues that maximisation of shareholders interests requires separation of board chair and CEO, stewardship theory argues shareholder value maximisation is achieved by shared positions of board chair and CEO (Donaldson and Davis 1991)⁽⁵⁴⁾.

Elkington (1998)⁽⁵⁸⁾ developed a concept of *triple bottom line* (TBL) exploiting stakeholder theory to measure the impact of CSR on the economic, social and environmental performance.

Around this time, global companies began to make corporate giving and to consider corporate social performance as a more comprehensive measure of performance. Most of the research in 1990s advanced the themes of: CSP, stakeholder theory, business ethics, sustainability and corporate citizenship.

In 1990s, the CSR concept continued to expand in the field of business practice. CSR started to speak about community involvement, socially responsible

products and processes, and employee relations. In 1992, a non-profit organisation called Business for Social Responsibility (BSR) was established to bring forward the initiatives and practitioners acknowledged responsibility for CSR in their companies. BSR included in the definition of CSR by several themes such as business ethics, community investment, environment, governance and accountability, human rights, marketplace and workplace. Then, it also argued terms such as corporate citizenship, business ethics, corporate accountability and sustainability could be employed as synonymous for speaking CSR.

In the 1990s several companies have acquired reputations for their CSR practices. Only to name a few large companies: Nike, Coca-Cola, UPS, IBM, Levi Strauss & Co., McDonald's, etc.

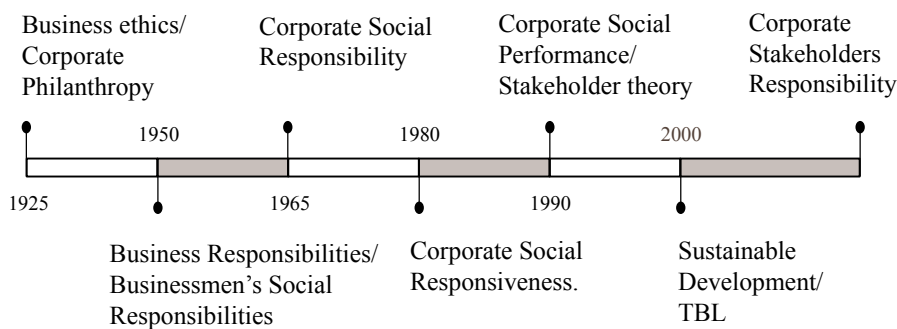


Figure 3: Historical evolution of CSR.

Twenty-first century was marked by the passage from theoretical conceptual model to the empirical quest of the themes like stakeholder theory, business ethics, sustainability, and corporate citizenship. This new approach permits to introduce issues concerning corporate social responsiveness, issues management, and stakeholder management. Further, an important line of literature presented CSR as a mean to know corporate involvement to social issues and communicate within the context of signalling models. These frameworks essentially affirm that CSR activities can possibly communicate important information about an enterprise to an uninformed actor, because they are affected with cost and hence can be used as a signal to reduce the asymmetric information premium (Jones and Murrell 2001)⁽¹¹⁵⁾.

Schwartz and Carroll (2003)⁽³²⁾ proposed a new three-domains model reviewed. In fact, they reduced again the four categories to three: economic, legal, and ethical. Stormer (2003)⁽¹⁹¹⁾ suggested to overcome the stakeholder model and consider, instead, an inter-systems model of business. In effect, corporations are not autonomous or independent units, but they are part of the communities that generated them (Solomon, 2004). This entails to pass from the 'egoic' perspective of the self as alienated to the 'postegoic' perspective of the organization self as interdependent (Driver 2006)⁽⁵⁶⁾.

During the twenty-first century several global organisations worked to develop best practices in CSR. Among these, for instance, Organization for

Economic Co-operation and Development (OECD) produced the guidelines in corporate social responsibilities (OECD 2001). The first version of the guidelines of OECD on CSR in 2001 included voluntary initiatives for its member countries. Also in fields of application such as labour standards, environment, human rights, and fighting bribery, one could detect several differences about involvement and management. Furthermore, research works favoured theoretical and managerial claims according to which “not only is doing good the right thing to do, but it also leads to doing better” (Bhattacharya and Sen, 2004; Kotler and Lee, 2005)⁽¹⁴⁾ ⁽¹¹⁹⁾. Perrini (2005)⁽¹⁵⁹⁾ examined non-financial disclosure of CSR from corporate social, environmental and sustainability reports for ninety European companies and concluded that companies’ disclosure is related to operational efficiency, environmental protection, quality & innovation, open dialogue, skill development, and responsible citizenship.

Further, Habisch et al. (2005)⁽⁹⁴⁾ documented the perspectives of CSR development across Europe and argued that CSR is one of the most important topics for discussion for business people, politicians, trade unionists, consumers, NGOs, and researchers. In his work for UK, Moon (2004)⁽¹³⁸⁾ showed the evolution of CSR within governance of society in the country, and proved how this evolution favoured the diffusion of CSR in the European Union.

Respect to the US, the concept of CSR in Europe is strictly linked to stakeholder responsibility. In this regard, Lydenberg (2005)⁽¹²⁵⁾ noted that the deployment of CSR in Europe was seen as driven by “a long-term re-evaluation of the role of corporations in society”.

The sustainable development theory included the theories and concepts until the 21st century, enhancing the concepts of CSR and triple bottom line. For instance, the stewardship theory was encompassed into the triple bottom line by Aras and Crowther (2009)⁽⁹⁾ in order to formulate sustainable development model. The model shows the effect mutually reinforcing of financial, social and environmental resources to ensure sustainability. By pointing on internal and external interests of a company, the authors highlight four aspects of CSR as follows: economic aspect, to justify the company’s existence; social aspect, to combat poverty and preserve human rights; environmental, to maintain the nature for future generations; organizational culture, to match the corporate and social values with those individual.

By merging stewardship theory with triple bottom line, new models such as the DNA of CSR 2.0 model, practitioner-based model of societal responsibilities and consumer driven corporate responsibilities model were developed. Visser (2011)⁽²⁰⁴⁾ argued that for shifting from CSR 1.0 to CSR 2.0 was needed to straighten the current trends of many of the world’s most crucial social, environmental and ethical issues. According his opinion, a transition from the classic concept of CSR as “corporate social responsibility” (called CSR 1.0), to a new CSR (called systemic or radical CSR, or CSR 2.0) labelled as ‘corporate sustainability and responsibility’ happens. The new CSR 2.0 is based on five principles (creativity, scalability, responsiveness, glocality and circularity) and underpins a new DNA model of responsible business, developed starting from

four elements of value creation, good governance, societal contribution and environmental integrity.

A practitioner-based model of societal responsibilities provided managers' views from a CSR perspective specifically speaking. According to Pedersen (2010)⁽¹⁵⁶⁾ the attention on the triple bottom line approach highlights a more practitioner-based model of social responsibilities. Furthermore, this stresses the different facets in managers' views of CSR. In fact, some managers assume towards CSR a reactive approach and therefore they apply CSR only to respect responsibility and avoid risk, whereas others managers adopt a proactive approach because they interpret CSR as an attempt to realize broader change in society. This approach intends the responsibilities of a company for products, people and environment not only as internal operations, but also as a way for creating value for the stakeholders rather than only for shareholders. Although practitioner-based model is inspired by stakeholder theory, it does not give stakeholders' interests the same importance and considers CSR as a core business activity of a company. Yet the managers think that employees and customers are more valuable than the other stakeholders. Starting from stakeholder theory Gholami (2011)⁽⁸⁷⁾ elaborated value creation model, according to which the value creation for an organization and society is lead by synergy between them because of the tie between CSR and corporate performance, which encompasses financial and non-financial performance. Furthermore, Gholami (2011)⁽⁸⁷⁾ drew on also Carroll's (1991)⁽³⁰⁾ pyramid model that assumes that economic, legal, ethical and philanthropic responsibilities are to be provided by a company to create value for organization and society.

In addition to the concept, measurable indicators for each of the themes of the pyramid were explained under the value creation model proposed by Gholami (2011)⁽⁸⁷⁾.

Gholami (2011)⁽⁸⁷⁾ proposed, within value creation model, indicators of economic aspect as personal saving rate, business saving rate, inflation rate and manufacturing lead time; indicators of legal aspect as anti-trust law, labour training law, taxation law and human rights; whereas ethical aspect regards codes of conduct, corruption and money laundering matters. Also, as key indicators for philanthropic aspect, Gholami (2011)⁽⁸⁷⁾ advised donor acquisition, donor attrition, stewardship calls and gift processing time. The value creation model has as independent variables: economic, legal, ethical and philanthropic aspects; as control variables: organizational dimensions of culture, technology, centralization and training; and as dependent variables: classical measures of corporate performance such as return on investment (ROI), return on equity (ROE), return on asset (ROA), operating income (OI) and non-financial corporate performance encompassing access of capital, business value, business savings, social value.

Finally, Claydon (2011)⁽⁴⁵⁾ developed the model of consumer driven corporate responsibility which, like value creation model, was shaped by Carroll's pyramid model, and like it, considers that main aspect of a company is economic one. Furthermore, the model merged the concept of sustainability with the sustainable development theory, stating that at the aim to result sustainable, a company has to

maintain profitability. Yet, sustainable profitability can be obtained thanks to ethical and responsible behaviours towards its consumers, which represent the most important stakeholders. This model confirmed that CSR allows to obtain competitive advantage for a company where customer base is not well-consolidated, but also to preserve profitable situation in the event in which the customer base is consolidated and customers continue asking company for CSR. Therefore, the company has to fulfil the CSR demand in order to maintain its reputability and profitability. This model highlights a cycle; in fact, CSR implemented by a company will entail an increase of customer base to which corresponds an increase of profitability. Then the profitability from CSR in turn entails a greater reputation, which enlarges customer base. A higher customer base entails the increase of consumer demand for CSR, and then it grows CSR implemented by the company.

Chapter 2

Corporate Social Responsibility and Stakeholder Theory

2.1 Introduction

Within the conceptual framework proposed at the first time in the 1960s and advanced until 1980s, several definitions of the term “stakeholder” were provided.

The term "stakeholder" is employed in different means according to the context. In general terms, "stakeholder" is synonymous of "citizen". We mean saying that "stakeholder" refers to who takes part in the public life. Among the specialist, the term "stakeholder" comprises all of those persons who don't belong to the shareholder category. Simply put, the term "stakeholder" indicates who has a "stake", that is an interest toward something and, in larger terms, "stakeholder" is who participates or takes part in something. The term "stakeholder" is stemmed by analogy with the term "stockholder", which identifies those who divide the profits, that is the shareholders. The term want to highlight that parties different by stockholders have a role and an interest in the firm activities and that those should be acknowledged. The term refers to individuals and groups of individuals necessary to the continued survival of the firm; hence they are called to participate directly in decision-making processes. But based on this definition it is not clear from which point of view the question of the survival should be pose (from that of the firm or from that of the stakeholder). So for the Swedish administrative research school of the 1960s, represented by Rhenman and Stymne (1965)⁽¹⁷¹⁾, the notion of stakeholder should be characterized by a relationship of reciprocity. In fact, stakeholder depends on the firm for fulfilling its own goals, but the firm depends on stakeholder for its survival.

The term stakeholder appeared for the first time at a conference held at the Stanford Research Institute in 1963 to speak about "all groups on which an organization is dependent for its survival". Yet, 20 years later the term became popular thanks to Freeman (1984)⁽⁶⁹⁾. Freeman employed the term to refer to “an

individual or group of individuals which can affect or be affected by the achievement of organizational objectives.” In such a way, only who cannot influence, for incapacity, and who is not influenced by the actions of an organization, for lack of relationship, is not included in this definition. However, it should also be said that the corporation might influence a stakeholder, yet it might not have the capacity to influence in turn. Nevertheless, potentially it might collaborate or threaten the organization. Furthermore, even if the term is often strictly related to the private sector and the corporate world, it can also be associated with the link between the business world and public life. In fact, it underlines how several interests cannot be separated, because the corporations act in an environment that is not only economic and legal but also social, political, cultural, and ecological. Really, for establishing who is a stakeholder is necessary to carry out an analysis about the situation of a corporation. In the public discussions or in the discussions on corporate management, generally the stakeholder is an actor involved in a project. This concept is brought together with a family of concepts crossing several social sciences. If you see the stakeholder theory as the intention to change the mode by which one can approach to the governance, therefore decision-making, acting and wishing are to be included in a project. As a consequence, you can say that the theory evidences the arguable character of the differentiation between those who have rights and those who have not them.

Mitchell et al. (1997)⁽¹³⁷⁾ proposed ceasing the debate around the meaning and definition of stakeholders, answering to the question on who really have importance for the firm. According to this view the stakeholder theory is to be considered only in a perspective of usefulness to the corporation.

Starting from these controversial points, the discussion is evolved and the term has acquired a wider significant, becoming a concept, and later a problematic of strategic management, that has provided a considerable scientific production.

Between the years in which “Strategic Management: A Stakeholder Approach” was published, and 2010, which was marked by “Stakeholder Theory: The State of the Art, Strategic management, and Stakeholders”, various ideas were delivered, showing how interesting the theory is.

The concept of stakeholder underpins a theory, emphasizing analytically the corporate governance and the strategic decision-making processes of the firm.

2.2 “Stakeholder” in Strategic Management: from the Concept to the Theory

The scope of the firm and the nature of duties towards society were examined and argued long before Freeman. After the 1929 crisis, the idea that the corporation must balance the competing interests of different participants in order to favour their continued collaboration begin to get ahead. There, after the 1929 crash, several companies accepted four actors as stakeholders: customers, employees, the community and stockholders (Hummels, 1998)⁽¹⁰³⁾.

Other authors began to care about the issue of the identity of the main groups involved in the identity of the firm. Rhenman and Stymne (1965)⁽¹⁷¹⁾ perceived the firm as a social and technical system in which stakeholders have a significant role; Ackoff (1974, 1994)⁽⁵⁾⁽⁶⁾ was the first researcher who intuited that the simply notion of stakeholder could be exploited, with the aim to generate a conceptual model. Giving a representation of the corporation and identifying the goals of organizations, he produced an early body of stakeholder theory. Ackoff thought that the corporation was supposed to balance the competing needs of different groups, to which it was tied, modulating its goals with the interests of those groups fairly.

Yet, between the late 1960s and the mid-1980s, the theory received little attention in the fields of management, strategy and ethics. So that evaluators for publication of a Freeman's article on stakeholders suggested him to put the term stockholder in place of stakeholder. However, the most complete version of stakeholder theory is in "Strategic Management: A Stakeholder Approach" by Freeman (1984, republished in 2010)⁽⁶⁹⁾. According to Freeman, it was necessary to link the concepts of the organization and the corporation in order to introduce a strategic, political and moral view, which looked for negotiation and communication. In his opinion firms depend on third parties, which make demands related to risk caused by economic activity. In this context Freeman formulated the key concept (1984) of stakeholder theory: "Simply put, a stakeholder is any group or individual who can affect, or is affected by, the achievement of the organization's objectives." Still, in other words, stakeholders are any group or individual who can collaborate with a corporation, by invoking its strategy.

By keeping in mind these groups and their interests, whether they are internal or external to the corporation, an organization must decide its strategies based on the societal expectations. Much important is the theoretical framework of this approach, because the issue has to do with deals with different groups. And the interests of these groups cannot be seen only as sum of specific interests, but they need to be addressed as a whole. Thus, theoretical research regarding the role of stakeholders laid the foundations of a real analytical context in order to analyse in a significant way the relationship between the corporation and its internal and external environment. For continuing in this direction, Freeman made a map of the stakeholders in a specific firm. Furthermore, he examined several potential negotiation processes depending on particular themes about specific groups of stakeholders. Discussion relied on dialogue, with the aim to favour free and voluntary collaboration (Freeman, 1984)⁽⁶⁹⁾.

Later, Freeman (1984)⁽⁶⁹⁾ showed how stakeholder theory could be employed to establish the principal views of a corporation. Examining stakeholder is equivalent to examining the values and social issues which corporation must face. Furthermore, the analysis of stakeholders allows corporation to evaluate not just financial value but also its social and societal performance (Figure 4).

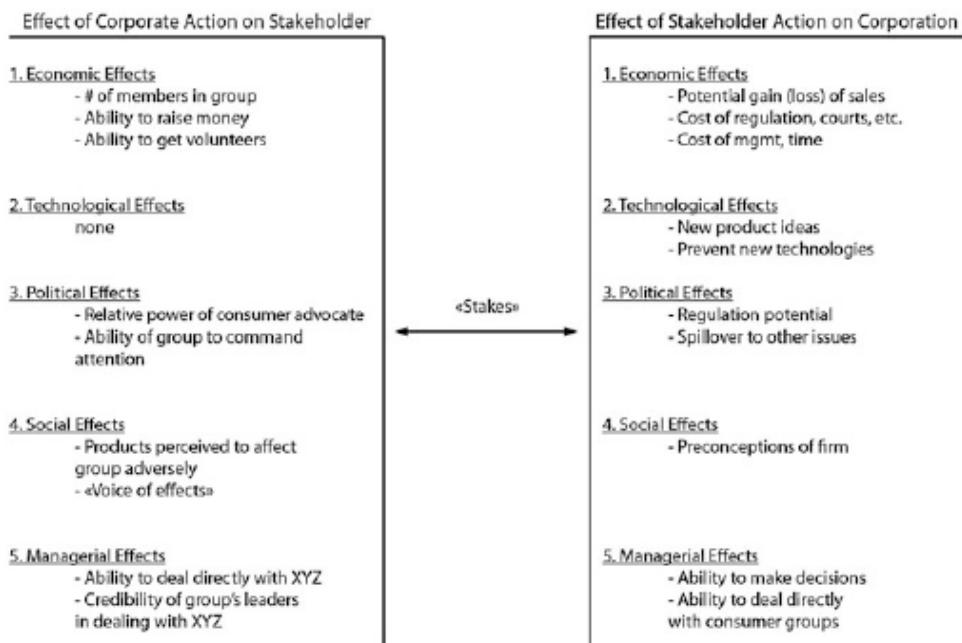


Figure 4: Impact of the corporation on stakeholders/Impact of stakeholders on the corporation. (Source: R.E. Freeman, Strategic Management, Pitman Publishing Inc, Boston, 1984).

With “Strategic Management: A Stakeholder Approach” (1984), Freeman contributed not only to develop a theoretical framework (the value creation by stakeholders versus the financial value creation), but also to provide new approaches for realizing corporate strategy.

With his approach to the objectives of the corporation and to the way by which corporation responds to environment in which it acts, Freeman changed the traditional frameworks of strategy. He stated, further, that the fulfilment of the stakeholders needs makes the firm more capable to generate profits. Shortly, “Strategic Management: A Stakeholder Approach” represents a pragmatic approach, in order to identify and deal with stakeholders for evolving business. Consequently, as said by the same Freeman, stakeholder theory is an operational theory permitting firms not only to draw up and put in practice their own strategy, but also to assess it.

2.2.1 Yardsticks of the Theory

After 30 years of discussions and debates, it is possible stating that stakeholder theory is fundamentally a theory of corporate strategy, adopted by researchers in several fields that span from business ethics, organization theory to political sociology and science.

Really, stakeholder theory acquired increasing relevance in the field of strategy (Freeman 1984, 2001; Martinet and Reynaud 2001)⁽⁶⁹⁾⁽⁷³⁾⁽¹²⁹⁾. Within this field, stakeholder theory re-evaluates the concept of the corporation lead by agency theory (Jensen 2000)⁽¹⁰⁹⁾ according to which the organization is to be assessed based on only its ability to create value for shareholder.

In 1970 Friedman⁽⁷⁹⁾ affirmed in the New York Times "the social responsibility of business is to increase its profits". By having a financial objective not only permits to pursuit the interests of the owners of the corporation, but creates also a framework within which scarce means are arranged, managed, used as well as possible (Stewart 1994)⁽¹⁹⁰⁾. This view thinks the corporation as production fabric, which receives "inputs" and gives back "output" through a transformation process. Successively, the creation of value is realized by selling these "outputs" on competitive markets (Martinet 1984)⁽¹²⁸⁾.

On the contrary, stakeholder theory doesn't perceive the corporation only built on the particular interests of its owners and stakeholders. Shareholder value (short term) is posed against the stakeholder value (medium- to long-term). In fact, the creation of value by means of stakeholders is a strategic choice, tending to pursuit both survival and development objectives. But, it is obvious that if corporation has to consider interlocutors other than shareholder, it will have more constrains regarding resources. Due to these interlocutors, it has to develop a competitive strategy, which covers different needs. As consequence the corporation forges a society and not only a market (Martinet 1984)⁽¹²⁸⁾. To manage strategically the stakeholders means to guess their expectations and use them as instruments of development of the organization. It means, further, to recognise their contribution to the creation of value. This approach is for internal (investors, the ensemble of collaborators) or external (consumers, suppliers, civil society, public authorities) stakeholder to the corporation. These interests become "stakeholders" in the strategic policies of corporation (Freeman 1981, 2010; Hitt et al. 2001)⁽⁶⁸⁾⁽⁷⁶⁾⁽¹⁰¹⁾. The corporation thus acts also on behalf of its stakeholders (Freeman 2007)⁽⁷⁵⁾.

The distinction between economic and social can represent an obstacle to the corporate legitimacy. According to the capitalism, the corporation has a certain autonomy depending on the trust, granted in advance, in economic actors. That autonomy is also based on a trust, given in advance, in society, since the corporation's institutional legitimacy explains its right to make profits freely without the need for self-justification. However, being the pragmatic legitimacy often contested, the corporation is lead to admit its dependence on external elements. This is an essential point of stakeholder theory, which discusses regarding the role of business in society and how the economic dimension is socially integrated.

Really, if the corporation is thought as existing not only in the market, but also in society, then the sociality of the economy and the integration of corporation in society is a natural process. This consideration is in Karl Polanyi's "The Great Transformation" (1944)⁽¹⁶⁵⁾. The phenomenon of globalisation has reinforced the idea of the corporation as an embedded system. Many approaches have been used to deal with issue, yet that adopted by stakeholder theory results pragmatic and strategic. It is for this reason that business ethics have, in the model of stakeholder theory, a strategic aspect.

The researchers focused on two main issues, namely the identity of stakeholders, and who really has relevance and weight and for whom.

The stakeholders can be a group, an organization, an association, or a subject as for instance an aspect of the natural environment. Yet, according to this much broad definition anything might be a stakeholder. That is why, Bowie (1988)⁽¹⁹⁾, Freeman (1994)⁽⁷⁰⁾ and Nāsi (1995)⁽¹⁴⁴⁾ tried to provide a more specific definition. In order to achieve the task, a fundamental criterion was established, with the aim to find the third parties involved and to establish the modes for dealing with them. This means that the strategic context and the gain of a competitive advantage cease to have an exclusive link. Therefore, the corporation once again is view as the core for examining sometimes conflicting expectations, stakes and interests.

Given that establishing all of the stakeholders in an organization is very complex, some scholars have provide categories of actors, without considering cases of specific companies.

One of the most effective stakeholder classifications is that of Mitchell et al. (1997)⁽¹³⁷⁾. Their classification is developed answering to three questions: is there a real or potential power by stakeholders that makes them capable to place their needs in front of other groups? What is the legitimacy that they have? And what is the urgency by which the organization has to meet their requests?

When the interests of stakeholders are in conflicting with those of either the corporation or other stakeholders, the parties have the duty to negotiate. Negotiation can be made with several modes based on the way in which various stakeholders feel the situation but also the way in which they are felt.

Groups having the three attributes (power, legitimacy, urgency) are termed definitive stakeholders and are thus part of the negotiation process. Instead, depending on the number of attributes that various actors have, they attend in negotiation with a different degree of engagement.

Those with two attributes, namely urgency and legitimacy, are defined dependent stakeholders. Instead stakeholders with power and urgency can be dangerous. Still, stakeholders with power and legitimacy are called dominant.

Those with only one attribute are called dormant (power), discretionary (legitimacy), or demanding (urgency) (Figure 5).

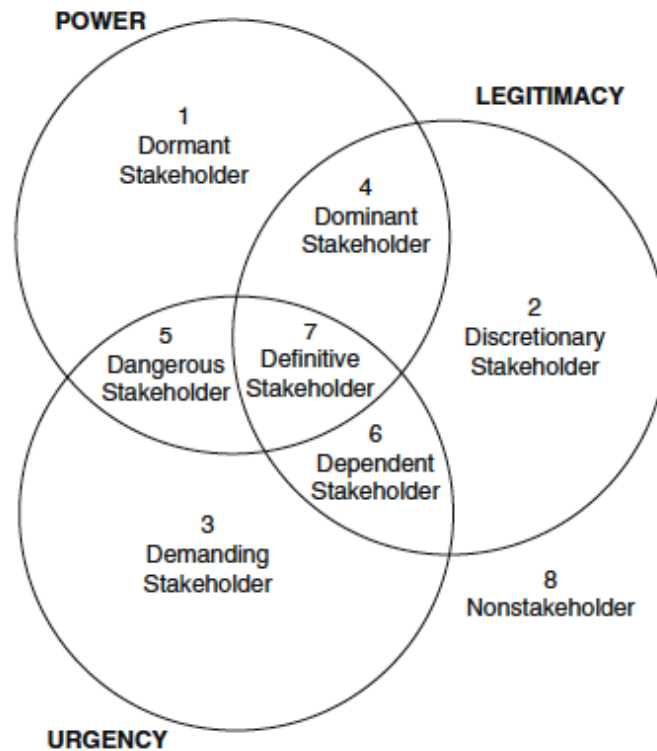


Figure 5: Stakeholder typology (Mitchell, Agle and Wood).

(Source: Mitchell, Agle and Wood, "Toward a Theory of Stakeholder Identification and Salience: Defining the Principle of Who and What Really Counts", *The Academy of Management Review*, 1997, 22/4, 874).

Less operational and less important classifications than Mitchell et al.'s (1997)⁽¹³⁷⁾ exist. These classifications are based on the concept of primary and secondary stakeholders. Some of them distinguish internal and external stakeholders. Even if these distinctions are simplistic and don't consider the relational content of the theory, they result practical. However, the perspective from which actors can be seen has a particular importance for Hill and Jones (1992)⁽¹⁰⁰⁾. Not considering "the ubiquity of stakeholders" (Martinet, 1984)⁽¹²⁸⁾ is a strong limit of this classification. Indeed, it means neglecting the fact that an employee can also be a consumer of the products he or she manufactures. Yet, a common element to all of these authors is that discourse regards contracting parties. In fact, the relationship between stakeholders (and not only between the corporation and its stakeholders) falls within a non-dual explanatory framework; therefore it isn't reduced to a discussion between the corporation and whatever is outside to it. Hence, in its diagnostic and management approaches, the corporation has to form uncommon alliances or to face the competing needs of individual stakeholders.

According to Clarkson (1995)⁽⁴³⁾, there are two categories of stakeholders, which he terms voluntary and involuntary. For the author the distinction is between stakeholders taking on risk by means of investments of human or financial capital and those not taking any risk. Based on this distinction, shareholders are clearly stakeholders, as are entrepreneurs. But, this classification is far from the stakeholder approach, which primarily distinguishes between

stakeholder and shareholder, in an attempt to offer an alternative to the orthodox vision of corporate governance.

Other, less important, typologies look at different categories of actors: public actors (Tichy et al. 1997)⁽¹⁹⁴⁾; archetypal actors (shareholders, employees, clients, suppliers); recognized actors (banks, insurance companies, enterprise networks, unions, public authorities, international organizations, civic associations, NGOs); controversial actors (competitors, the media, activists, the natural environment) (Lépineux, 2005)⁽¹²²⁾. Other tertiary stakeholders are those, which cannot express themselves, such as natural elements (oceans, mountains, animals), and future generations (Starik, 1994)⁽¹⁸⁸⁾. Some authors refer to them as silent or mute stakeholders represented by third parties (NGOs) who argue for their interests. Typologies and classifications serve as operational model for making decisions and negotiating for and with stakeholders.

Yet, the limit of such classifications consists precisely in the way by which they depict the society, namely as if it was a set of actors of varying value (or threat) in relation to the corporation. An important element in Agle et al.'s⁽¹³⁷⁾ typology consists in the making a hierarchy of categories of actors based on the interests of the company. But, even if the stakeholder theory considers the actors, it doesn't provide typologies in function of the interests and issues that the actors express. In this sense, stakeholder theory gives a partial view of civil society, thought as a set of conflicts for competing interests. Instead, it would be useful examining arguments on which the motivations of stakeholders are depending, in order to consider issues arisen beyond specific groups of actors.

The point of view from which the relationship between stakeholders and the organization is considered changes theoretical perspectives developed by scholars. Three approaches to the theory were provided.

The descriptive approach to stakeholder highlights a series of convergent and divergent needs (Moore 1999)⁽¹³⁹⁾. Within this, it depicts new forms of organization (multinationals, transnational companies, subcontracting networks and associations) representing multiple interests (Kochan and Rubinstein 2000)⁽¹¹⁸⁾. It considers the relationships between the organization and the environment, assuming the existence of an environment as an objective given, which exerts forces towards the organization that the same organization cannot control (Desreumaux and Selznick 2009)⁽⁵³⁾. Yet, in order to smooth the distinction between the organization's internal environment (components), and its external environment (degree of complexity, stability, availability of resources), the theory offers different organizational levels (intra, inter, external). Even if this approach has an explicative nature, it can be adopted as a methodological framework (Caroll and Bucholtz 2000)⁽³¹⁾. Furthermore, it represents a decision-making tool for directors; in fact while the identification process of stakeholders occurs, attempts are being made to manage the stakeholders detected.

The instrumental approach looks for address the relationship between company and stakeholders, putting in agreement profit and performance of the company with other interests, which affect it either directly or indirectly. Its strength is in to measure relative influence of stakeholders (Jones and Wicks,

1999)⁽¹¹⁴⁾ considering together the triple bottom line and the interests of the company and assuming that the more the company fulfils expectations, the more it develops. However, its weakness is to reduce contrasting interests in a set of contracts between shareholders, directors and stakeholders. It's like if space of negotiation regarded only the interests of the three parties. Supporters of the instrumentalist approach state that it's wrong saying that shareholders and stakeholders have specific obligations. The concept of the “balanced scorecard” assumes that the company considers the following areas of performance: environmental, social and economic. Furthermore, the profit is another practical application that can be moved into its stakeholders. Jones (1995)⁽¹¹³⁾ proposed this approach; anyway, not that often an operational view of the theory is coupled with an instrumental approach.

According to the normative approach, the expectations of stakeholders have legitimacy, for own nature; therefore regardless of the survival of the company, they deserve a response. In this sense, the normative approach appears as an ethical theory. In fact, it imposes on the company to assume a responsible behaviour towards its stakeholders (corporate stakeholder responsibility). Several principles are based on the notion of stakeholders, and according to those, managers must accept interests external to the company, due to the risk that it can cause to society. Furthermore, managers must be prompt to cope potential struggles that stakeholders, given their exposed nature, can generate. In this sense, ethics assume a strategic dimension. The normative approach, saying that the stakeholders are legitimate (Donaldson and Preston 1995)⁽⁵⁵⁾, authorizes them to participate in corporate governance, connecting again business ethics to strategy (Gibson 2000)⁽⁸⁸⁾. Yet, governance moves in the framework of asset-based salaried capitalism. "Asset-based" is when shareholders invest capital in order to develop their assets. Instead, “asset-based and salaried” is when the capital invested derives also from private individuals. Even if stakeholder theory is in contrast with the classical representation of shareholder value (Charreaux and Wirtz, 2006)⁽³⁶⁾, it embraces a contemporary framework of governance, namely an asset based salaried capitalism, admitting open participation by stakeholders. The basis idea is that all stakeholders can, potentially, become shareholders. The theory looks for enlarging the objective of asset-based capitalism.

Unifying the various aspects of theory, Wicks (1999)⁽²¹³⁾ provided a convergent theory of the stakeholder approach. But the question about the fact if three approaches (descriptive, instrumental and normative) can be summarised remains. Still, in the same year, Freeman orientated the entire management science community, affirming that neutral form of stakeholder theory doesn't exist and requesting divergent approaches (Freeman 1999)⁽⁷²⁾.

2.3 Merging CSR and Stakeholder Theory

This section deals with the connections between the corporate social responsibility (CSR) concept and stakeholder theory and highlights the main

streams within the CSR literature that show the essential elements in the development of the concept and its connections with stakeholder theory.

Actually, the stakeholder theory can add value to the debate around CSR, by introducing and merging financial and social concerns. It is widely accepted that purposes underpinning corporate social responsibility are more likely to be fulfilled when they are dealt with company stakeholder responsibility.

Davis (1960)⁽⁵¹⁾ argues that the firm has social duties, which oblige it to go further than law requirements. Furthermore, he disagrees with Friedman who maintains that the corporation should bother only to maximize the profit without doing more than fulfill the legal requirements. Davis justifies his thesis from a managerial standpoint, stating that, if social obligations are avoided, a very dangerous corporate strategy can emerge. In fact, due to the “iron law of responsibility,” when society assigns legitimacy and power to business, “In the long run, those who do not use power in a manner which society considers responsible will tend to lose it” (Davis 1960: 314)⁽¹⁹⁾.

Really, one can uncover clues of stakeholder theory in Davis’s approach to CSR, specially with respect to the idea that organizations have to accomplish obligations which concern not only the stockholders. Also, he assigns to the need of enlarging corporate obligations an instrumental value, because: “to the extent businessmen do not accept social responsibility obligations as they arise, other groups eventually will step in to assume those responsibilities and the power that goes with them.” (Davis 1973)⁽⁵¹⁾. Post (1978, 1981)⁽¹⁶⁷⁾ takes a step forward in development of the CSR concept suggesting the practical processes through which corporations should care of the “management of public issues.” According to Post, this new corporate strategy was necessary to fit to a rapidly changing economic, social, and political context. Like Venkataraman (2002)⁽²⁰¹⁾ who refers to the strategic management of the firm as to an “equilibrating mechanism” thought to see solutions that systematically consider and constantly balance the interests of all the corporation’s stakeholders, Post explicitly speaks of mechanism for balancing interests of “constituencies” and “publics” (the term “stakeholder” was not (yet) employed). He highlighted the importance of synergy between firm and society from which emerged the need for organizations to meet stakeholders (Post 1978)⁽¹⁶⁷⁾.

Due to the relevance of these connections, the corporation has to deal with its capacity to fulfill “the publics with which it interacts.” Post thinks that as a fundamental part of strategic management, if not, some other actions (e.g. public regulation) would have been necessary. The distance between public expectations of performance and the firm’s actual performance shouldn’t be too large, otherwise the corporation could be delegitimized and “either corporate action or public action would have to occur in order to narrow the expectations/performance gap” (Post 1978)⁽¹⁶⁷⁾. By examining several case studies, Post stated that neither adaptive nor proactive approaches designed “ad hoc” to face external change by corporations could be effective, because the concept of CSR should be a central component of the strategy and policy formulation process, and not an “add-on” to a given, profit-making corporate

strategy. Frederick (1994)⁽⁶⁶⁾ speaking about the early development of CSR which he called "CSR1" affirmed that scholars study the normative implications for the main idea that corporations have to respond to the society concerning their activities. According to Frederick this idea has generated four linked discussions: (i) What's the meaning of CSR, and what are the actions that a corporation have to do for being defined socially responsible? (ii) What's the ratio in which economics and social good have to stay for being balanced? And (iv) what are the moral principles supporting the CSR? Is there a moral principle from which corporate duties toward society can be resulted?

While some authors debate about the definition and the meaning of the CSR concept, working, thus, on a semantic plan, the others one adopt a different approach, shifting the focus on empirical investigation plane (Ackerman 1975; Sethi 1975; Frederick 1978; Carroll 1979, 1991; Wartick and Cochran 1985; Wood 1991)⁽³⁾⁽¹⁸³⁾⁽⁶⁵⁾⁽²⁹⁾⁽³⁰⁾⁽²⁰⁹⁾⁽²¹⁵⁾.

Carroll pointed out that these authors dealt with the CSR model looking at exclusively "the notion of obligations of business and motivation", neglecting the dimension of "corporate action and performance". This consideration implies the need of shifting the attention from a responsibility scope to responsiveness scope, intended as capacity which emphasized the "corporate action, pro-action and the implementation of a social role"(Carroll 1991)⁽³⁰⁾. Frederick (1978, 1994)⁽⁶⁵⁾⁽⁶⁶⁾ interprets CSR2 (where R is for responsiveness) as the ability of a corporation to respond to social pressures. He wonders if a company can respond, if it will respond and how it will do and with what effect (Frederick 1994)⁽⁶⁶⁾. CSR2 assumes thus a descriptive approach to investigate the process of CSR1. According to Sethi⁽¹⁸³⁾, CSR2 distinguishes from CSR1 for several facets: the relation between firm's management and prevailing "ethical norms" (executives have to take a clear position regarding public issues and don't assume a neutral posture about business); the "operating strategy"; and the firm's "response to social pressure", leaving a diplomatic approach in favour of a approach which is willing both to inform about action in being and to negotiate with external groups.

This focus on external groups recall the concept of stakeholder theory based on the idea that corporate has to balance the needs and the expectative of all of these groups, highlighting in this case the demand of information concerning corporate strategies and actions. Another interesting tie with the stakeholder theory lies in the following Sethi's claim: "corporate social performance is "culture-bound," that is, since the social, cultural, and political scenarios are constantly evolving, "a specific action is more or less socially responsible only within the framework of time, environment and the nature of the parties involved" (Sethi 1975)⁽¹⁸³⁾.

The Carroll's three-dimensional model is an attempt to explain the corporate social performance (CSP) and its tie with the CSR. Therefore, Carroll adds to the three dimensions others two dimensions. Specifically, the adopted behaviour's typology and the particular social issues involved in the relationship. The model's objective is to encourage managers to establish how different social issues can be faced using some attitudes, namely, a reacting, defensive, accommodating, or pro-

acting behaviour; depending on where they perceive that the issue can be placed in the continuum of the four responsibility categories of a firm.

Wartick e Cochran ⁽²⁰⁹⁾ recognized the operating and complementary character of Carroll's CSP model which allows "the underlying interaction among the principles of social responsibility, the process of social responsiveness and the policies developed to address social issues" (Wartick and Cochran 1985: 758)⁽²⁰⁹⁾. The authors emphasized these three dimensions, yet they state that the issue management is not well specified; in fact Carroll speaks generally of "issue areas"; therefore they proposes the following path: issue identification; issue analysis and response articulation. In this view they refer to the stakeholder theory, affirming that it can have a positive role for the issue of management literature. CSR based on the separation between business and society and business and ethics don't help to resolve the three problems for which, instead, stakeholder theory proves to resolve. In fact, the problems regarding the value creation and the trade don't fall among the scopes of CSR unless firm makes value influences negatively the society. CSR has nothing to say about how value is made, because ethics is a reconsideration of the value-creation process.

By adding to the social responsibility the financial responsibility of the firm, CSR advances the problem between capitalism and ethics. Ethics have to be connected to what firms (large banks and financial services firms) do and to how they make value, otherwise they take the risk of not be able to meet their elementary responsibilities to their stakeholders and could cancel value for the entire economy. Furthermore the issues identified have to be tied to day-to-day activities. In practice, CSR has to be integrated in the management. It is essential to redraw up the managerial function as moral function and not add an ethical safeguard too late in the process; otherwise CSR strengthens the belief that business marginalizes the moral issues.

2.3.1 The role of Stakeholder Theory in the main CSR research topics

Herein after I present various subthemes of the CSR and the role that the stakeholder theory view plays in the discussion.

At certain time several researchers began to look at the stakeholder theory like an approach to define better and make operational the concepts of CSR. Wood's work⁽²¹⁵⁾ provides an optimal tie with the stakeholder theory. Wood states that the first thing is to review the purpose of the corporation. And for doing it, one have to pass from shareholder view (the Friedman's view, according which the only social responsibility for a society consists in the maximization of the profits) to a "social" vision according which the purpose has to encompass some wider social interests.

Simply put, for embracing a stakeholder theory approach, managers have to leave the idea that the shareholder value maximization is the principal objective of corporation, and they have to accept, instead, the idea that when they define the goal of the corporation, they have to consider the needs of specific groups of

stakeholder. That is, one has to shift from a shareholder view to a wider stakeholder view.

Wood (1991)⁽²¹⁵⁾ re-elaborates the CSP concept and tries to advance the Carroll's model (1979)⁽²⁹⁾, reviewing also Wartick e Cochran (1985)⁽²⁰⁹⁾. She maintains that CSP has to be defined in terms of actions and outputs and not of interactions. Furthermore, Wood thinks that the social responsiveness can refer to several processes by which corporation can offer an answer to the societal issues. Also, according to Wood the role that Wartick and Cochran assign to the policies is too much limited, and in doing so they don't recognise that a larger range of actions, behaviours, and programs beyond the written and formal policies can enhance social performance. That is, she says, "if a policy does not exist, it cannot be inferred that no social performance exists" (Wood 1991: 693)⁽²¹⁵⁾. In view of those clarifications, Wood proposed a review definition of CSP as "a business organization's configuration of the principles of social responsibility, processes of social responsiveness and the policies, programs, and observable outcomes as they relate to the firm's societal relationships" (Wood 1991)⁽²¹⁵⁾. In the Wood's view the CSP isn't something of completely separated by corporate performance, further, the definition, so as given, represents a construct for assessing the business outputs. Yet, these outputs have to be re-conciliated with declared values concerning adequate relationship between business and society.

Likewise, Windsor (2001)⁽²¹⁴⁾ is critical towards currents which say wealth has to be integrated in the management processes in order to increase the social welfare while maximize the profits. He argues that the tie between financial performances and social responsibility isn't clear-cut. That is, in his opinion, significance larger should be assigned to the discourse concerning the responsibility, a significance that moves beyond of the wealth creation notion. In 2006, he claims that the ethical responsibility and that economic don't share the same moral frameworks, but, conversely their frameworks are contradictory and haven't been well integrated, and, furthermore, corporate citizenship literature don't reflect adequately both problems. Windsor provides an instrumental interpretation of the citizenship within social responsibility. This instrumental view recognizes to the philanthropy a role of strategic decision to enhance the reputation, and to increase the market possibilities. Furthermore, he believes that negative externalities impacting on stakeholder or society, represent a real cost. In fact, they can provoke a damn to the production, and reduce the consumptions to the detriment of the general wellbeing. However, Windsor hopes a governmental intervention, rather than managerial discretion and pro-action, because he sees complaint or lawsuit or change in public policy as means for resolving the problem.

Pedersen explains the way by which companies translate abstract concepts into practices. In his opinion, CSR is strictly related to the stakeholder theory, as the same definition says. Furthermore, CSR has an eclectic nature and is not narrowed down into specific strategies, specific stakeholders and/or specific environmental issues (Pedersen 2006)⁽¹⁵⁶⁾. Also, he highlights five engagement levels for the dialogue with stakeholder: inclusion, openness, tolerance,

empowerment, and transparency, which are influenced by factors including consciousness, commitment, capacity, and consensus.

Munilla e Miles (2005)⁽¹⁴²⁾ argue that CSR has three ways for engaging stakeholders: compliance (in this case the expenditures are thought as costs of doing business), strategic (where CSR is acknowledged as an investment in the firm's competencies), and forced (where CSR is perceived as a tax imposed by external stakeholders). Obviously, Munilla and Miles say that compliance and forced ways reduce the firm's capacity to make strategic advantage.

Carson (1993)⁽³³⁾ provides a version of the stakeholder view that copes the social purposes of the business in stronger mode respect to the preceding wordings by Goodpaster. And this version remembers the Friedman's version about social responsibility. Carson (1993)⁽³³⁾ thinks that managers have to favour the interests of all stakeholders, but he believes that the obligations towards some stakeholders are more important than the obligations towards other stakeholders (making a distinction between minor interests of more important stakeholders and major interests of less important stakeholders). According to Carson there are positive obligations towards some stakeholders that are bound by negative obligations such as not laying or not breaking the law. Yet, Carson doesn't say the modes to assess the relevance of a stakeholder group respect to other, but he suggests that the value proposition of a firm can be one point by which begins. However, many scholars have tried, as we saw, to explain CSR concept, defining the criterions by which companies relate themselves with specific stakeholders.

Chapter 3

Corporate Social Responsibility, Financial Performance and Innovation

3.1 Introduction

The relationship between CSR and financial performance (FP) has been studied in several empirical analyses, which were examined in depth by Orlitzky et al. (2003)⁽¹⁴⁹⁾ and Margolis et al. (2007)⁽¹²⁷⁾. Yet, according to the authors, most of the works consider only the relationship as one-directional, namely, they investigate the way in which CSR affects the financial performance of a firm (Margolis et al., 2007)⁽¹²⁷⁾. Furthermore, the studies considered don't explain the mechanism and the direction of causality of the relationship.

Theoretically there are three concepts useful to treat the relationship between CSR and CFP, i.e. stakeholder theory, slack resources theory and the virtuous circle concept. As widely discussed in the previous section, stakeholder theory entails that the interests of a large group of stakeholders are met by examining wide range of CSR (Freeman 2010; Donaldson and Preston 1995; Preston and O'Bannon 1997)⁽⁷⁶⁾⁽⁵⁵⁾⁽¹⁶⁹⁾. While, the way in which a firm is involved in CSR activities depends on the its financial resources, in the slack resources theory (Preston and O'Bannon, 1997; Orlitzky et al., 2003)⁽¹⁶⁹⁾⁽¹⁴⁹⁾, and the virtuous circle explains bi-directional effect of CSR and FP (MacGregor and Fontrodona, 2008; Vilanova et al., 2009)⁽¹²⁶⁾⁽²⁰³⁾.

If the link between CSR and CFP has been widely treated, the same thing cannot be said for the connection of CSR and innovation. In fact, CSR and innovation together have rarely been studied in the literature, expressly. And if the management literature offers concepts about how CSR and financial performance are tied, the link of CSR to innovation is only poorly faced (e.g. Porter and Kramer, 2006)⁽¹⁵⁵⁾. Empirical studies regarding the relationship between CSR and

innovation are scarce (McWilliams and Siegel, 2000; Bocquet et al., 2013; Szutowski and Ratajczak, 2014)⁽¹³⁴⁾⁽¹⁶⁾⁽¹⁹³⁾. Some case studies give some initial knowledge on the link between CSR and innovation (e.g. Clausen and Loew, 2009; Halme and Laurila, 2009)⁽⁴⁴⁾⁽⁹⁵⁾.

3.2 State of the art on CSR and financial performance

3.2.1 Combining social and financial concerns

As a consequence of what we have seen in the previous sections, if we follow the evolution of CSR from the perspective of stakeholder theory, we can distinguish at least two different currents for the embedding of the financial and social themes that seem to go hand in hand and are part of the debates of scholars and practitioners.

The residual view of CSR is the leading view on CSR that was elaborated in the 1960s and 1970s, and is still the most accepted in today's academic and business discussions, especially in the American culture. According to this view, CSR is a nonstrategic activity that could be explained using the "giving back to society" proposition. In fact, there is a moral duty and several good practical motivations for corporations to give back to society some of the value they have gained. Put simply, this view conceives ex-post profit distribution. For corporations and researchers accepting residual CSR, having socially responsible behaviour means to "add on" a social role to business, without changing the classical view of business that sees the economic scope - profit maximization - as the principal (and, according to Friedman, the only morally acceptable) social responsibility of the corporation.

The second view of CSR is integrated approach. It conceives CSR as the embedding of social, ethical, and environmental issues into the management methods for corporate strategy. This view is clearly accepted by scholars in management and business ethics who think that the main idea of stakeholder theory is "to integrate ethics and social issues directly into strategy," as we described in Chapter 2 (CSR and stakeholder theory). Basically, it receives the core ideas of the stakeholder approach and it recognises that the management of any economic organization encompasses, by definition, the management of the relationship with its stakeholders. The integrated CSR approach does not consider CSR as if it was a set of additional obligations respect to a "business as usual" model, but, on the contrary, it thinks to redesign the corporations' "political and legal status, and for the scope of their managerial responsibilities" (Post, Preston, and Sachs 2002a: 11)⁽¹⁶⁸⁾. Therefore this perspective pays attention to ex-ante value creation, not on profit distribution.

Even if several firms coordinate synergistically their processes, they still consider financial concerns more relevance than social concerns, yet they feel the need to face social concerns efficiently and coherently. For instance, Porter acknowledges that several philanthropic activities are being adopted by corporations, in order to create positive ties with their core business or the

interests of their key stakeholders: “No business can solve all of society’s problems or bear the cost of doing so. Instead, each company must select issues that intersect with its particular business” (Porter and Kramer 2002: 5–16)⁽¹⁶⁶⁾.

Matten and Moon (2008)⁽¹³¹⁾ provide a distinction between explicit and implicit CSR, which represent American and European views respectively. They state that due to institutional differences and cultural norms, CSR strategies change depending on the regions. American firms typically embrace an explicit CSR strategy, traceable to residual approach, to pursue individual firm-level benefits. This strategy is based on the assumption that the “real” purpose of the firm is to maximize profits. Whereas, the implicit (European) model, in line with the integrated approach, looks at a culture of collective engagement on the part of business to better society. The basic assumption is that the firm there is to advantage society.

3.2.2 Inquiring the space between CSR and financial performance

Over the last four decades many scholars have looked for prove there is a positive relationship between CSR initiatives and business outcomes. To be able to measure the benefits, especially economic, derived from socially responsible activities can contribute to disseminate these practices and restore the fair balance between ethics and economics. Most studies on the topic, developed to achieve a final result, have highlighted that CSR strategies affect positively corporate performance. In particular, the most significant contributions are those of Margolis and Walsh (2003)⁽¹²⁷⁾, Orlitzky et al. (2003)⁽¹⁴⁹⁾ and Van Beurden and Gössling (2008)⁽²⁰⁰⁾. Yet, these authors have pointed out as, within the empirical researches considered, there are multiple critical issues, which undermine the general validity of the argument. The meta-analysis carried out by Orlitzky et al. (2003)⁽¹⁴⁹⁾ had the aim to overcome some errors made in the previous analyses concerning the advantages brought by CSR. The novelty in the work of these authors is to mainstream data used in the studies already published, introducing some mediating factors. These scholars were able to prove the predictive validity of the stakeholder theory in the form of its instrumental approach (Orlitzky et al., 2003)⁽¹⁴⁹⁾. This capacity appears through the positive correlation between social performance and financial results. However, Orlitzky et al. (2003)⁽¹⁴⁹⁾ have suggested to proceed developing other analyses in this filed, because many critical issues persist, first of all the need to create a better theoretical definition (Orlitzky et al., 2003)⁽¹⁴⁹⁾. However, it is worth noting that many quantitative researches examined by Orlitzky et al. refer to works published earlier than 2000, yet several studies on the topic were carried out over last two decades making emerge various new issues. The findings of literature review have confirmed the lack of final evidence about the enhancement of the economic performances as a result of the implementation of CSR strategies.

In fact, what emerges from literature review is that a large number of papers don’t reveal a positive and significant correlation between financial performance and social responsibility. In addition, the scientific community remains sceptical

even about those works that report partial results, and state that socially responsible practices affect corporate performance with some limitations.

The conclusion that the tie between two parts is positive varies depending on CSR dimensions, CSR assessment criterion, analysis context, sample under investigation, and applied method.

Even when the connection between CSR and financial performance is highly positive, one can highlight some critical issues and provide suggestions to overcome them. Therefore, both in the case of completely and partially favourable link, there are strong limitations for deriving a general validity of obtained findings. As consequence, one can conclude that there is not a final prove of the relationship. Nevertheless, to point out limitations and offer suggestions for future research enables formulate hypothesis with the aim to overcome the critical issues raised.

Main problems concern: sampling and data quality, reliability of dependent and independent variables measurements and the methods employed. Furthermore, it is worth pointing out that a firm's economic outcomes depend on both place in which it resides and sector in which it works.

Both factors influence the quantity and the intensity of socially responsible actions implemented by a company. Garcia-Castro et al. (2010)⁽⁸⁵⁾ think that a potential explanation of the heterogeneity of empirical results is due to multiple circumstances, which don't yet know. Further, time factor is too much neglected in the cross sampling, and this is why through these sampling one cannot capture the long-term effects caused by socially responsible initiatives.

In addition, another mismatch among the works, for which they are incomparable, is represented by the variables used to measure the results coming from the strategies of social responsibility (Perrini et al. 2009)⁽¹⁶¹⁾.

Some examples of variables are: the level of pollution (Bragdon et al., 1972; Bowman et al., 1975)⁽²²⁾⁽²¹⁾, the evidence of environmental practices (Clarkson, 1988; Christmann, 2000)⁽⁴²⁾⁽⁴⁰⁾, the reputation gained (Cochran et al., 1984; Preston et al., 1997)⁽⁴⁶⁾⁽¹⁶⁹⁾, the third parties assessment (Hart et al., 1996; Russo et al., 1997; Waddock et al., 1997; Graves et al., 2000; McWilliams et al., 2000)⁽⁹⁸⁾⁽¹⁷⁶⁾⁽²⁰⁵⁾⁽⁹⁰⁾⁽¹³⁴⁾ and voluntary disclosure initiatives (Blacconiere et al., 1997)⁽¹⁵⁾. Yet, the analysis of literature highlights that indices of social responsibility and corresponding ratings are the most applied. Most indices employed are the set of Kinder Lydenberg Domini (KLD) indices and those developed using similar methods. For developing these indices, many dimensions of CSR are evaluated as the environmental dimension (Gerde and Logsdon, 2001)⁽⁸⁶⁾. Some authors, including Wagner (2010)⁽²⁰⁷⁾, have proved that by integrating social responsibility into the environmental management allows identifying the fundamental characteristics of these activities with respect to the benefits that these activities entail. Therefore, they suggest applying this method to all CSR dimensions. This means that to consider the activities concerning the environmental management through the lens of CSR enables to see, and consequently to enhance, those characteristics which influence positively the society. In this regard it is worth noting that the assessment of the CSR activities

and those linked to the environmental protection have been often employed as proxy of social performance (Garcia-Castro et al., 2010; Orlitzky, 2001; Waddock et al., 1997)⁽⁸⁵⁾⁽¹⁴⁹⁾⁽²⁰⁵⁾. KLD indices are criticised in literature because they are created without considering the different weight and nature of the various CSR activities especially in relation to sector taken into account (Kang et al., 2009)⁽¹¹⁶⁾. But, this is not a negligible detail. Indeed, the cross comparisons are not feasible because, as Steger (2007)⁽¹⁸⁹⁾ affirms, various aspects of the social responsibility have different importance depending on sectors. The practices included in the environmental dimension of CSR have a major weight in the chemical and energy industry respect to weight that they have in textil, food and beverage or toys manufacture industries where the actions related to social factors prevail (Menz, 2010)⁽¹³⁶⁾. Furthermore, these indices depict better the American context, and are based on the managers' perceptions or financial experts opinions.

Other indices of social responsibility very widespread are based on the concept of shareholder value. Wood (1991)⁽²¹⁵⁾ defines the social responsibility performance as the observable outcomes in the relationship between company and society, therefore the CSR evaluation through a only stakeholder group is not adequate. Indeed, CSR activities are planned for responding to interests of a wide range of stakeholders (Weber, 2008)⁽²¹⁰⁾. These observations are aligned with the CSP definition of Wood and Jones (1995)⁽²¹⁶⁾. According to which the results of CSR initiatives are the effects of their implementation for internal, external and institutional stakeholders. For evaluating corporate performance, Salzmann et al. (2005)⁽¹⁷⁹⁾ observe that indicators based on internal accountability and those resulting from the market value show some critical issues, because they take into account different aspects of corporate performance. The former, in fact, can be skewed by accounting procedures and by different allocation of the resources depending on the specific characteristics of the sector. Whereas, the latter could reflect a higher value of the effective financial result (Salzmann et al., 2005)⁽¹⁷⁹⁾.

Among other indices used to measure corporate performance one can find also economic and financial indicators as well as objective indicators based on the economic trends. In the econometric models the control variables are used as explanatory factors of the corporate performance and of the relationship between corporate performance and social responsibility. In this regard, it is worth noting that while some scholars state that the control variables serve to not alter the results (Callan et al., 2009)⁽²⁶⁾, others think that the tie between control variables and independent variables, i.e. social responsibility, can generate collinearity problems, invalidating the whole analysis. Furthermore, over the last decade papers about an extensive interpretation of the relationship between CSR and not strictly economic benefits were published. Among the not economic benefits, the trust consumers and the company reputation can be mentioned.

Galant and Cadez (2017)⁽⁸¹⁾ provide a comprehensive synthesis of measurement approaches of both corporate social responsibility and financial performance. According to the authors, the approaches used in the literature to measure CSR can be grouped as follows: (1) reputation indices; (2) content analyses; (3) questionnaire-based surveys; and (4) one-dimensional measures.

The reputation indices category encompasses the MSC KLD 400 social index (e.g. Erhemjamts, Li, & Venkateswaran, 2013)⁽⁶⁰⁾, Fortune magazine reputation index (e.g., Preston & O'Bannon, 1997)⁽¹⁶⁹⁾, Dow Jones Sustainability Index (e.g., Škare & Golja, 2012)⁽¹⁸⁶⁾ and Vigeo Index (e.g., Girerd-Potin, Jimenez-Garcès, & Louvet, 2014)⁽⁸⁹⁾. Still, they mention national indices like the Index of CFIE-French Corporate Information Centre for French companies (Ducassy, 2013)⁽⁵⁷⁾, Respect index for Polish companies (Lech, 2013)⁽¹²¹⁾ and CSR Index for Croatian companies.

CSR dimensions evaluated by the main indices are different in the number, but they are similar in the key themes considered, that is natural environment, employees, society, and so on. Each index has specific characteristics and specific application fields in terms of number of firms rated, geographic area covered, underlying CSR dimensions, and industry sectors taken into account. Further, the main advantages depend on data availability (thus minimising data collection effort) and comparability across firms. Content analysis of corporate communication represents another way of measuring CSR. Content analysis usually requires establishing the expressions of interests, and looking for information about them and operationalizing qualitative information into quantitative scales that can be employed in statistical analyses. Further, content analyses can include different dimensions and different levels of coding sophistication. This method allows specifying CSR dimensions of interest, gathering data on the dimensions and translating them in operational data to be used in statistical analysis. Yet, it presents a strong subjective nature due to the way in which it is created. A questionnaire-based survey is usually employed when a particular company is not rated by a rating agency and corporate reports are unavailable to realize a significant content analysis. One-dimensional constructs focus only on a single dimension of CSR, for example environmental management or philanthropy.

The previous reported discussion suggests that there is no acceptance on which index is the best measure of CSR. Among approaches for measuring financial performance both accounting-based and market-based indicators can be mentioned. Accounting-based measures are available for all firms and they are fairly comparable. Market-based measures produce modifications in CSR faster than accounting-based measures. As for limitations, accounting-based measures are historical. Further, relativized accounting ratios such as return on assets (ROA) may be incomplete if the sample encompasses firms from different sectors. Whereas, the strongest limitation of market-based measures is that they exist only for publicly listed companies. In addition, market-based measures inevitably embed systematic market features, conversely accounting-based indicators depend on company specific perceptions of CSR (McGuire et al., 1988)⁽¹³³⁾. It is worth noting that some researchers have joined both types of measures by using indicators such as Tobin's Q (market value/total assets) or MVA (market value-book value of equity and debt) (Garcia-Castro, Ariño, & Canela, 2010; Rodgers, Choy, & Guiral, 2013)⁽⁸⁵⁾⁽¹⁷²⁾. Others have also tried to develop a comprehensive measure of financial performance by combining different existing measures to

create one integrated index. Peng and Yang (2014)⁽¹⁵⁷⁾ used factor analysis to integrate several financial performance measures into a solely index. Furthermore, the financial health of a company was another measure employed as a proxy for accounting-based company profitability (Rodgers et al., 2013)⁽¹⁷²⁾. One could say that currently there is the trend to use more than one measure of CFP.

Finally, what emerges from analysis carried out is that a wider study regarding the factors influencing CSR (CSP) and corporate performance should be performed (Surroca et al., 2010; Schadewitz et al., 2010; Garcia-Castro et al., 2010)⁽¹⁹²⁾⁽¹⁸¹⁾⁽⁸⁵⁾. For example, it would be necessary to analyse deeply the firms' features, the reasons underlying the adoption of CSR, and the context influence on the CSR initiatives and their effectiveness. According to some authors, for instance, the CSR evaluation, based on the perception, should be extended to several stakeholder groups, in order to enrich the relationship, providing more details about aspects, which enlarge its vision. According to some authors, including Maggio et al. (2008), the approach using the case study to evaluate the optimal level of social responsibility initiatives is the most adequate. The search of optimal level of social responsibility is also aligned with the request of deeper investigations about the conditions which allow firms to share with society the gained benefits (Margolis, 2003)⁽¹²⁷⁾. Boesso (2010)⁽¹⁷⁾ suggests carrying out analyses more extensive regarding the concerns of context in order to plan more effectiveness ad hoc initiatives for firm, but also in order to resolve critical issues emerged by the context analysis. Chang (2008)⁽³⁵⁾ argues that it is very important investigating the strategies of the social responsibility to increase corporate economic performance. This current encourages measuring CSR based on the ability to meet the requests coming from all stakeholders.

One question emerges from the previous analysis: What are the factors influencing the adoption of socially responsible initiatives? The influencing factors analysis highlights that the CSR effectiveness affects the results. Yet, usually, this factor was excluded from econometric models because, according to some scholars, the interrelation with the independent variables could invalidate the analysis.

3.3 An examination on literature addressing CSR and innovation

3.3.1 Glancing to core innovation studies

Research on innovation includes several disciplines with economic approaches, which include further theoretical perspectives.

These theories focus on some issues such as the reasons leading firms to innovate, the factors which influence or obstacle the innovation.

According to Fagerberg et al. (2012)⁽⁶³⁾ who realized a meta-study using 277 different surveys on innovation studies published between 1993 and 2010 in 11 "handbooks", some main contributions of the literature have theoretical thrust, such as Shumpeter's text "The Theory of Economic Development", depicting

innovation as a dynamic force that produces changing in social, institutional and economic structures (Andersen, 2011; McCraw, 2007)⁽⁸⁾⁽¹³²⁾.

Another relevant theoretical text is "An evolutionary Theory of Economic Change" by Nelson and Winter (1982)⁽¹⁴⁵⁾ which links Shumpeterian and evolutionary perspectives with concepts of theories on organizations and human behaviour, in order to develop a theory for explaining how corporations form firm-level knowledge, the strategies adopting with respect to innovation, and the results of their actions. Nelson and Winter's work has inspired subsequent works on "knowledge-based firms", "technological regimes" and "industrial dynamics", to remember some relevant topics. Cohen and Levinthal (1990)⁽⁴⁷⁾ also focus on the importance of firm-level knowledge, namely so-called "absorptive capacity", considered essential for the capacity to look for and make use of external sources of knowledge in innovation.

Other contributions regard new concepts or frameworks of analysis and their application. The two books by Nelson and Lundvall on "National Systems of Innovation"⁽¹⁴⁶⁾ published around 1990 and subsequently became landmarks both inside and outside academia. As said above the innovation-systems framework points out the need to investigate the connections between several factors that affect a country's innovation and growth performance. Another largely spread framework of analysis, mainly among analysts and policy makers treating with regional concerns, which also regards the connection between domestic factors in boosting innovation and growth, is Porter's framework (1990)⁽¹⁵⁴⁾. Also, another example of an original concept that has given one the idea for subsequent work is Pavitt's (1984)⁽¹⁵³⁾ empirical "taxonomy" of innovation activities in several sectors and industries. An important overview of the current knowledge of innovation is Freeman's "The Economics of Industrial Innovation"⁽⁶⁷⁾ originally published in 1974, which illustrates the 'state of the art' of knowledge in the field.

The overview on the diffusion of innovations (Rogers, 1962)⁽¹⁷³⁾, which has captured interest in a wide range of disciplines and scientific fields, contains a novelty. Indeed, it is written from a sociological perspective, regarding the conditions that influence the decisions by users about products or technologies new to them.

It is worth noting that the innovation literature is used by scholars in a wide range of disciplines and fields beyond social science proper. Furthermore, the role of "Management" scholars among the users has increased currently. It may be because Business and Management Schools, and hence Management as a scientific field, are grown in recent years. But it may also be due to the fact that innovation has become a core topic of Management scholars' programmes.

3.3.2 Looking into the tie of CSR and innovation

An investigation of the fit or space between CSR and innovation is developed through a theoretical discussion that advances a conceptual understanding of the relationship.

Even if CSR forms part even more of debate globally for searching greater value and competitiveness, CSR and innovation together have rarely been studied in the literature, in an obvious way. Furthermore, although the innovation is viewed as one of the main drivers of competitiveness, it is difficult to realize and there is a clear that “though innovative effort appears to be widespread, this does not translate directly into improved firm performance and, ultimately, greater profitability” (Hoffman et al., 1998)⁽¹⁰²⁾.

To be successful and innovative today, companies cannot neglect the social and environmental impact of their operational processes, promote creativity of employees, and work together with their customers, suppliers and other business partners in search of new products and services. In doing this, organisations have to keep an ethical behaviour because the expectations of customers and society have grown. Fortunately, the idea that innovation exclusively coincides with high technology and new products is giving a way to the view that innovation is a broad, continuous, systematic activity that takes place throughout the enterprise (Sawhney, Wolcott, and Arroniz, 2006; Hamel, 2006; Vila and MacGregor, 2007)⁽¹⁸⁰⁾⁽⁹⁶⁾⁽²⁰²⁾. Yet, this awareness is probably learned only by extremely structured organizations. In fact SMEs have a departmentalised concept of innovation or exclusively consign innovation to the marketing function. A departmentalised application was a special feature of the CSR field, too, with CSR sometimes rising as a reactive behaviour related to the company’s public relations department. Anyway, this concept is starting to spread throughout the company culture.

The concepts of CSR and innovation have been dealt separately, yet there are certainly much work in which discussion involves both themes. That is the case of sustainable development (Carpenter and White, 2004)⁽²⁸⁾. Indeed, within this concept we can identify elements that allow a deep investigation of the contact zones between CSR and innovation. For example, Sustainable Design (and other related terms in the design field, such as Design for Re-use, Design for Environment/Eco-design) brings together innovative solutions and environment-related issues considering criteria throughout the innovation process. The design area includes other movements that regards several aspects of CSR: Design for All, regards the design of products and services that may capture a larger percentage of the population, paying attention to specific categories such as elderly and disabled. These lines of design can be allocated to the Social Design movement, formulated primarily by pioneers such as Buckminster Fuller and Victor Papanek. Fuller was the first designer to introduce social issues in the design field, stating that, and “making the world’s available resources serve one hundred percent of an exploding population can only be accomplished by a boldly accelerated design revolution.”⁽⁸⁰⁾ Victor Papanek, student of the work of Fuller, contributed to develop the Social Design field (Papanek, 1985)⁽¹⁵¹⁾. He created a basis for the fields of Design for the Third World and Design for Older People, among others, claiming, “designers and creative professionals have a responsibility and are able to cause real change in the world through good design.”

Therefore, it can be said that Social Design joins the development of human and social capital with the development of profitable new products and processes. Another important contribution to the field comes from Whiteley (1993)⁽²¹²⁾ who develops the work of Papanek and others by drawing up areas such as Inclusive Design, Ethical Manufacture and Eco-design and Sustainability. Although in the 1980s the focus was the environment, only nowadays people becoming conscious of sustainable design. Currently, the attention given to the climate changes and the environment issues at large could inspire an approach more responsible by companies toward society in general. A relevant contribution is Socially Responsible Design (SRD) (Davey et al., 2005)⁽⁵⁰⁾. SRD includes in existing design fields, such as Design for Environment, concepts of responsibility and sustainability through an additional approach. By adopting this approach SRD is viewed as “CSR in action”. Really, understanding and implementation of design is a key step for companies to integrate CSR in the production of the products, processes, environments and services that contribute to enhance their image in the marketplace and consequently their market positioning. The SRD theme includes eight areas (government, economic policy, fair trade, ecology, social inclusion, health, education and crime) which can be successfully oriented by means of design and which lead to a healthier social environment. Furthermore, according the authors SRD “focuses attention on the products, environments, services and systems that can alleviate real world problems and improve quality of life.”⁽⁵⁰⁾

In a CSR perspective, companies have to innovate on products, in order to match the request for socially responsible products, and on processes, with the aim of monitor the implications of social responsibility throughout supply chain. Furthermore, legislation and environmental concerns have pressed in on production processes and use and recycling of second hand materials. Also, the request for free-trade products has prompted the companies for ties with NGOs in order to buy and sell products from and to developing countries. The same thing happened for the design with regard to its production processes and its products, which, in fact, have been re-drawn up for adapting to disadvantaged social groups. Another relatively recent movement is Open Innovation (Chesborough, 2003)⁽³⁷⁾ which has as essential part of its thought the dialogue with stakeholder and therefore is closely linked to one aspect of CSR.

Anyway, connecting the overall concept of CSR with the overall concept of innovation is very difficult. However, from somewhere it is necessary to start in order to establish some common areas, which may represent a framework to pursue a more robust discussion for actual combination of the two concepts, encouraging academic dialogue and real application. As regards the CSR, few works examine the advantages economically (as image in the marketplace), politically (as better legal awareness) or ethically (as realization of moral issues). However, according to Paine (2003)⁽¹⁵⁰⁾, there are four areas for which managers should have to consider values: risk management, organizational functioning, market positioning and corporate citizenship positioning.

The aim of this section is to advance the discussion of the link between CSR and innovation in order to address better strategy design and policy development

in organisations, by exploiting the recent boost in awareness and motivation and improved companies' real CSR and innovation performance.

Joseph Schumpeter (1883-1950) was one of the most original social scientists of the 20th century. The work of Joseph Schumpeter has heavily affected theories of innovation. In fact, he is considered the innovation-theorist, to him is attributed the definition invention and innovation, and the clarification regarding their differences of meaning. If invention represents the idea for new product and process, innovation consists of its implementation. To translate an invention in an innovation, the innovator normally has to use several different types of knowledge, capabilities, skills and resources; for instance, production and market knowledge, skills, adequate financial resources, and so on. Therefore the innovator, called by Schumpeter the "entrepreneur", brings together all factors necessary, and may not coincide with inventor. Whilst in many cases inventor and innovator don't coincide, from the other, also a significant time lag between the invention and innovation may occur. Several factors can affect the time lag passing from the definition of the requirements necessary for developing ideas to their implementation and they are: missing conditions for commercialization, still inadequate demand, absence of essential inputs or complementary factors because not still existing, and so on. In fact, an innovation is often the effect combined of many innovations. Kline and Rosenberg (1986)⁽¹¹⁷⁾, in a relevant paper, state that: "it is a serious mistake to treat an innovation as if it were a well-defined, homogenous thing that could be identified as entering the economy at a precise date – or becoming available at a precise point in time. (...) The fact is that most important innovations go through drastic changes in their lifetimes – changes that may, and often do, totally transform their economic significance. The subsequent improvements in an invention after its first introduction may be vastly more important, economically, than the initial availability of the invention in its original form" (Kline and Rosenberg 1986, p.283)⁽¹¹⁷⁾.

Schumpeter defined five different types: new products, new methods of production, new sources of supply (i.e. development of new sources of supply for raw materials or other inputs.), the exploitation of new markets (i.e. opening of new markets.), and new ways to organize business (i.e. creation of new market structures in an industry). The economics looked at the two first of these. The terms "product innovation" and "process innovation" identify new or improved goods and services, and improvements in the systems to realize these good and services, respectively. Firms innovate because they wish improve their performance, by increasing demand or reducing costs, for instance; therefore, a new product or process represents a source of market advantage for the innovator. Firms can also increase demand by differentiating product, by opening towards new markets and by affecting demand for existing products. Also, by adopting new organisational methods can lead to more efficient and better quality operations and as consequence by rising demand or reducing costs.

Innovation can also improve performance by increasing the firm's ability to innovate. New production processes promote the development of a new range of products, whereas new organisational practices favour the acquisition of new

knowledge employable to develop other innovations. However, although product and process innovations were useful for studying some issues, other important aspects of innovation shouldn't be neglect.

Also, innovations have been classified as “incremental” or “marginal” innovations, against to those “radical” or “technological revolutions” based on whether improvements were or not continuous (see Freeman and Soete 1997)⁽⁷¹⁾. It can be affirmed that “radical” innovations regard the adoption of new technologies in a specific sector, whereas “technological revolutions” include a set of innovations, which can have a strong impact within different sectors or on the wider economy. The latter type is often called “general purpose technologies” (GPTs, see e.g., Lipsey et al. 2005)⁽¹²³⁾. Schumpeter paid particular attention the latter two categories because he thought that radical innovation and technological revolutions were more relevant. Yet, it would be wrong neglecting incremental or marginal innovations, because their cumulative effects may be of equivalent intensity and may help to understand long run economic and social change. According to Schumpeter “radical” innovations create major disruptive changes, whereas “incremental” innovations continuously advance the process of change. Indeed, the achievement of the economic benefits from “radical” innovations in many if not most cases is the result of several incremental positive changes.

For describing the process through which innovation “revolutionizes the structure from within, incessantly destroying the old one, incessantly creating the new one”, Schumpeter employed the term “creative destruction” (Schumpeter 1942, p. 83)⁽¹⁸⁴⁾. In short, according to Schumpeter, economic development is driven by innovation through a dynamic process in which new technologies replace the old. Christensen (1997, 2003)⁽³⁸⁾⁽³⁹⁾, instead, has used the expression “disruptive innovation” for innovations that through the breakthrough of new markets or market niches gradually threat existing business models.

Another important distinction is between innovation and imitation. When an innovation is replicated, we are faced with an imitation. It's worth noticing that the imitation is important as well as an innovation, because without imitation the social and economic impact of innovation would not be enhanced. According to Schumpeter's work the term innovator can be assigned also to an imitator who introduce the innovation for the first time in a new context

This is, for instance, the definition used by the European Union's Community Innovation Survey (CIS, see Smith 2004)⁽¹⁸⁷⁾. In general, the introduction of marginal innovation in a new context requires important adaptation ability and organizational changes (or innovations) that may significantly affect productivity and competitiveness. Furthermore, innovation studies deal also with mechanisms for innovations transfer through imitation or by other means, and the result from this process on innovation activity.

Though both CSR and innovation are well-established concepts, as mentioned, there are still several approaches how to exactly conceptualize and measure them. Based on the concepts described above, hereinafter I try to provide synthetic definitions for types of innovations, innovation activities and innovative firms.

According to Oslo Manual there are four innovation areas: product, process, marketing and organisational. Product and process innovations are very known concepts in the business sector, whereas marketing and organisational innovations haven't generally definitions well established as those for products and processes.

“An innovation is the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, workplace organisation or external relations.” (OECD, 2005: 46)⁽¹⁴⁸⁾. This definition of an innovation includes different innovations. Specifically, an innovation is the implementation of several types of innovations, i.e. product and process innovations. Basically, an innovation can be claimed when the product, process, marketing method or organisational method are new (or significantly improved) to the firm. That is, products, processes and methods that firms are the first to develop and those that have been introduced from other firms.

“Innovation activities are all scientific, technological, organisational, financial and commercial steps which actually, or are intended to, lead to the implementation of innovations. Some innovation activities are themselves innovative; others are not novel activities but are necessary for the implementation of innovations. Innovation activities also include R&D that is not directly related to the development of a specific innovation.” (OECD, 2005: 47)⁽¹⁴⁸⁾. An innovation deserves the name only if it has been implemented. And it can be said that a new or improved product is implemented when it is entered on the market. Whereas, new processes, marketing methods or organisational methods are implemented when they are truly put in practice in the firm's operations. Innovation activities change significantly in their nature depending on firm to firm. It is worth noting that an innovation can be the implementation of a single important modification, or of a series of incremental modifications that together realize an important modification.

“An innovative firm is one that has implemented an innovation during the period under review.” (OECD, 2005: 47)⁽¹⁴⁸⁾. Whereas, a product or process innovator can be defined as follows: “A product/process innovative firm is one that has implemented a new or significantly improved product or process during the period under review.” (OECD, 2005: 47)⁽¹⁴⁸⁾. One can identify four types innovations: product innovations, process innovations, marketing innovations and organisational innovations. Product innovations and process innovations strictly regard the concept of technological product innovation and technological process innovation.

“A product innovation is the introduction of a good or service that is new or significantly improved with respect to its characteristics or intended uses. This includes significant improvements in technical specifications, components and materials, incorporated software, user friendliness or other functional characteristics.” (OECD, 2005: 48)⁽¹⁴⁸⁾. The term “product” means both goods and services. Product innovations exploit new knowledge or technologies, or can experiment new uses or combinations of existing knowledge or technologies. Product innovations cover both the inclusion of new goods and services and

substantial improvements in the functional or user characteristics of existing goods and services. New products are goods and services that change substantially in their characteristics or planned uses from products previously made by the firm. Also, the design of a new use for a product with only few modifications to its technical specifications represents a product innovation. Substantial improvements to existing products can be done through partial modifications in materials, elements and other characteristics that increase performance. Product innovations in services encompass substantial improvements in how they are offered (for example, in terms of their efficiency or speed), new functions or additional characteristics to existing services, or the proposal of entirely new services. Design is a fundamental aspect of the elaboration and implementation of product innovations. However, design changes that don't entail a substantial change in a product's functional characteristics or planned uses are not to be considered product innovations. However, they can be claimed as marketing innovations. Routine upgrades or periodical modifications are also not product innovations.

“A process innovation is the implementation of a new or significantly improved production or delivery method. This includes significant changes in techniques, equipment and/or software.” (OECD, 2005: 49)⁽¹⁴⁸⁾. Process innovations are pursued with the aim to reduce unit costs of production or delivery, to improve quality, or to produce or new or significantly improved products. Production methods regard the techniques, equipment and software employed to craft goods or services. Such as, new automation equipment on a production line or the implementation of computer-assisted design for product development. Delivery methods refer to logistics of the firm and include device, software and techniques to provide inputs, arrange supplies in the firm, or deliver products. Bar-coded or active RFID (Radio Frequency Identification) goods-tracking system are examples of new delivery methods. Process innovations refer to new or substantial enhanced methods for the creation and supply of services. They can regard substantial modifications in the set of devices and software used in services-oriented firms or in the procedures or techniques used to deliver services. The adoption of a new reservation system in a travel agency, and the design of new techniques for managing projects in a consultancy firm represent examples of process innovations. Process innovations also refer to new or significantly improved techniques, equipment and software in secondary activities, such as purchasing, accounting, computing and maintenance. The acquisition of new or substantial enhanced information and communication technology (ICT) can be considered a process innovation if its aim is to improve the efficiency and/or quality of support activity.

“A marketing innovation is the implementation of a new marketing method involving significant changes in product design or packaging, product placement, product promotion or pricing.” (OECD, 2005: 49)⁽¹⁴⁸⁾. Marketing innovations try to better responding to customers requests, entering in new markets, or newly placed a product on the market, in order to grow the firm's sales. Marketing innovation consists in the adoption of a marketing method not yet employed by

the firm, substantially different from the firm's existing marketing methods. The new marketing method can be developed not only by innovating firms. Furthermore, new marketing methods can be implemented for new and old products. If product form and appearance change without modify the functional specifications or user characteristics, that is if product design is changed, then one can say that marketing innovations are changed, as a consequence of a modification of marketing concept. A marketing innovation in product design is the adoption of a substantial modification in the design of a furniture line in order to provide it an appearance more enjoyable. New marketing methods in product placement especially entail the use of new sales channels. Where for sales channels means methods employed to sell goods and services to customers, and not logistics methods. Examples of marketing innovations in product placement regard the adoption for the first time of direct selling or exclusive retailing, and of product licensing. Innovations in product placement can also refer to the employment of new concepts for the presentation of products. As, for example, the use of salesrooms for furniture that are reshaped basis on the themes, showing to customers the products in fully ornate rooms. Again, new marketing methods in product promotion entail to embrace new concepts for promoting a firm's goods and services. An example of new marketing methods in product promotion is branding, that is the creation of a fundamentally new brand symbol, which aims to place the firm's product on a new market or provide a new image for the product. Innovations in pricing regard the adoption of new pricing strategies to market the firm's goods or services. New methods for differentiating the price of a good or service according to demand or for offering the possibility to customers to select desired product specifications on the firm's Web site and then see the price for the specified product are considered innovations in pricing. On the contrary, new pricing methods whose sole purpose is to vary prices by customer segments are not innovations. Furthermore, periodical modifications in marketing instruments are generally not marketing innovations. For such modifications to be marketing innovations, they must embrace marketing methods not yet employed by the firm. Therefore, for example, the employment of existing marketing methods to reach a new geographical market or a new market segment is not a marketing innovation.

“An organisational innovation is the implementation of a new organisational method in the firm's business practices, workplace organisation or external relations.”(OECD, 2005: 51)⁽¹⁴⁸⁾. Organisational innovations permit to enhance a firm's performance by decreasing administrative costs or transaction costs, increasing workplace quality, obtaining no tradable assets or decreasing costs of supplies. An organisational innovation entails the adoption of an organisational method, in business practices, workplace organisation or external relations that has not been yet employed in the firm and consists in strategic chooses made by management. Organisational innovations in business practices entail acquiring of new methods to arrange procedures for the conduct of work. Among new practices there are actions aim to learning and knowledge spread within the firm, that is databases of best practices, lessons and other knowledge, made more easily available to others. Another examples are education and training systems for

employee growth and enhancing worker retention. Further, other examples are the adoption of management systems for production activity or supply operations, that is supply chain management systems, business reengineering, and quality-management systems. Innovations in workplace organisation entail new methods for allocating responsibilities and decision making among employees for the distribution of work within and between firm activities (and organisational units), but also new concepts as the integration of different business activities in order to structure of activities. An organisational innovation in workplace organisation is for example the adoption of an organisational model that engages the firm's employees in decision-making and promotes systems for exploiting their ideas. The decentralisation of management control or the shaping of work teams in which individual workers have more flexible job responsibilities represent instruments for realizing the task. However organisational innovations may also entail the centralisation of activity and greater engagement in decision-making. An example of organisational innovation in the structuring of business activities is the integration of engineering and development with production. New organisational methods in a firm's external relations entail new ways of planning relations with other firms or public institutions introducing new types of collaborations with research groups or customers, and the externalising of business activities in production, procuring, distribution, and ancillary services. Regarding organisational modifications implemented for a new managerial strategy are considered an innovation if they are the first adoption of a new organisational method in business practices, workplace organisation or external relations. For example, when the strategy is realized by means of new software and practices for substantiating information in order to promote knowledge spread among different divisions. Mergers and acquisitions entail organisational innovations only when the firm implements new organisation methods during the merger or acquisition.

Chapter 4

Research design, hypothesis development, and methodology

4.1 Introduction

As mentioned in the previous sections, in recent years the importance of CSR for the companies' sustainable development has been recognised. Scholars have proved that CSR actions entail competitive advantages, favour long-term stability and growth. Therefore, executives have to endeavour for finding solutions to make their companies more socially responsible and simultaneously economically competitive.

Over the past three decades the connection between CSR and economic performance got emphasis in the literature. Within the stakeholder theory, the relationship between CSR and financial performance is supposed positive.

CSR can be an organizational instrument that allows employing effectively the resources (Orlitzky et al., 2003)⁽¹⁴⁹⁾, showing a positive effect on corporate financial performance. Even if causality of the relationship between social responsibility and financial performance has not yet been shown, and it could be say that CSR has not effects clearly defined. In fact, the relationship has not been completely proved and mechanisms by means of which CSR improves the financial performance are not yet known. This is why many scholars have shown partial results.

Qu (2009)⁽¹⁷⁰⁾ explains that the gap of consistency between earlier and more recent studies is because current business environments are dynamics and more likely to plan CSR. The problem is even more complicated when the relationship regards small and medium-sized enterprises (Morsing and Perrini, 2009)⁽¹⁴⁰⁾. Therefore, in the specific case of SMEs, further studies should be carried out (Hammann et al, 2009; Torugsa et al., 2013; Gallardo-Vázquez and Sánchez-Hernández, 2013, 2014)⁽⁹⁷⁾⁽¹⁹⁵⁾⁽⁸²⁾⁽⁸³⁾. Actually, finding the impacts in the medium–long term is a complex operation. Furthermore, CSR strategies of SMEs

are not codified and indeed are based on informal relationships with their stakeholders (Battaglia et al., 2014)⁽¹²⁾.

While the relationship between CSR and economic performance has been examined in the past three decades, interest in the tie between CSR and innovation has only increased considerably in the last few years within the sustainability theme (Surroca et al., 2010)⁽¹⁹²⁾. Yet, even if several works point out the existence of a positive link, the nature of relationship is ambiguous, but most researchers find that the tie is bidirectional (MacGregor et al., 2007; Gallego et al., 2011; Bockquet et al., 2013)⁽¹²⁶⁾⁽⁸⁴⁾⁽¹⁶⁾.

In some firms led by values, the direction of the tie is from CSR to innovation, vice versa for those firms driven essentially by the creation of value the direction of the tie goes from innovation to CSR. In the first case the firms consider the impact of their activities on the environment and community without losing sight of profit. Furthermore, for these firms the link between CSR and innovation is stronger because CSR is embedded in the company's strategy. Some scholars aim to identify type of CSR strategy that promotes innovation (Sharma and Vredenburg, 1998; Perrine, 2012; Bocquet et al., 2013)⁽¹⁸⁵⁾⁽¹⁵⁸⁾⁽¹⁶⁾. Within the framework of supply and demand theory, McWilliams and Siegel (2000)⁽¹³⁴⁾ prove that the implementation of environmental actions may favour R&D investments, generating process and product innovations. Through a case study methodology, MacGregor and Fontrodona (2008)⁽¹²⁶⁾ examine the CSR-innovation link for firms from Spain, Italy and the UK. They find that CSR-driven innovation focus on products and services having social objectives, whereas innovation-driven CSR is intended for generating social process and is led by value. Wagner (2010)⁽²⁰⁷⁾ shows that CSR conceptualised as a multi-dimensional evaluation of a firm's responsible performance favours innovation and brings significant social advantages. However, Gallego et al. (2011)⁽⁸⁴⁾ exploring the bi-directional relationship between CSR and innovation prove that sustainable actions do not always create value and encourage innovation. Battaglia et al. (2014)⁽¹²⁾ perform a survey among 213 SMEs working in the fashion sector in two EU countries, Italy and France. Then they point out positive correlation between some variables related to CSR and innovation and intangible performance. Still, according to Surroca et al. (2010)⁽¹⁹²⁾ implementing CSR activities allows companies to keep their best employees, crucial to preserve leadership positions and enhance the innovative ability.

4.2 The research question: the multidimensionality of CSR and the focus on manufacturing

The literature analysis has allowed us to point out the uncertainties concerning the evidence of a positive relationship between socially responsible initiatives and both financial and innovative performance.

As mentioned earlier, social responsibility encompasses multiple dimensions, affording a complete corporate vision also in relation to social and environmental

aspects. The integration of CSR within the corporate strategy is desirable. Indeed, if this process occurs, all activities work synergically, and CSR doesn't result unglued from the corporate context. Several activities and instruments enable the achievement of the integration process. Some of them are standardized; others are designed ad hoc in function of the company's characteristics, and of the concerned stakeholders.

Therefore, whether on the one hand the CSR initiatives are differentiated, on the other the activities aim to enhance the relationship between company and its stakeholders. The social responsibility has been evaluated as a set of instruments to implement within the firm. Yet, those instruments need to be applied taking into account the firm characteristics, sector to which it belongs, and social-cultural context it works.

This approach emerges particularly in the empirical analyses, where the CSR concept appears explicitly separated from the corporate strategy. In fact, to obtain comparable results, objectively measurable solutions are employed.

Furthermore, in order to prove concretely that the CSR activities are efficient, only economic impacts have been studied. Yet, recently, some empirical analyses have investigated the advantages not strictly related to financial performance. This wider and more extensive approach affords to evaluate the essential factors for the long-run value creation (Porter et al., 2006)⁽¹⁵⁵⁾. However, it is worth noting that the CSR initiatives include several prerogatives, which translate into economic benefits only if they are integrated in the corporate strategy policies, in the company mission, and in its business organization.

Again, economic and financial results depend on the factors, which characterize a company. These factors determine also the success of the CSR actions, and the way initiatives influence corporate performance. Given that this issue is considered very complex, this research aims to simplify it. Therefore, the relationship between CSR and both financial and innovative performance is explored considering a specific sector. In this way we examine a set of firms all subjected to the same critical issues of market. Furthermore, the focus on a particular industry affords to capture specific effects and to see if the same social issues are treated in similar way (Griffin et al.1997)⁽⁹³⁾.

In fact, both CSR actions and the assessment of their impacts have to take into account that the requests of stakeholders vary depending on the critical issues of a specific sector and context. Therefore, I point out which CSR actions can contribute effectively to enhance corporate outcomes in a particular industry.

Initiatives of CSR have been evaluated considering homogeneous groups traceable to its different dimensions. Many scholars have faced the research topic concerning the relationship between CSR and performance for a specific sector (Griffin et al., 1997; Bauer et al., 2006; Inoue et al., 2011)⁽⁹³⁾⁽¹³⁾⁽¹⁰⁵⁾. Yet, the novelty of this research consists in attempt to combine the focus in the context of a specific sector and the study of the relationship between CSR, evaluated according to its defined dimensions, and performance, meant in extensive terms, that is economic, financial and innovative. Therefore, even if this research adopt objectives and methods of some empirical studies analysed in the previous

literature, it is intended to extend the view in the socially responsible actions assessment, in order to reinforce the theories supporting the implementation of CSR initiatives, which impact positively on the economic and financial performance and on intangible resources (i.e., innovations).

The objectives above defined have been formalized in the following research questions:

Q1: Does corporation improve its ability to achieve product and process innovations if it responds to needs of broad stakeholder groups?

Q2: Which CSR aspects determine a positive relationship between socially responsible initiatives and innovative performance?

Q3: Does the implementation of CSR initiatives, specifically designed to lead risk management, enhance financial performance?

4.3 The choice of industry to define research hypothesis

This section regards the relationship between social responsibility initiatives and manufacturing Italian companies' performance. Especially over recent years, these companies implemented and spread socially responsible practices. This entails an important advantage for present research, because it will be able to inspire future deepening in other sectors, also in those so far unexplored.

According to the classification of Ateco 2007 concerning the economic activities, and based on the NACE classification (Nomenclature of economic activities for the European Community), the manufacture is encompassed in the category which includes the physical or chemical transformation of materials, substances or components into new products. For materials, substances and the components means all the raw materials, namely the agriculture, the forestry, the fishing and the extraction of minerals, but also products coming from other manufacturing activities such as the alteration, the regeneration or reconstruction of products.

Manufacturing industry has an extremely important role in the Italian economy, as revealed by the 50th report about the social scenario of the country, prepared by CENSIS(34: "In Italy, the manufacturing sector employs about 80% of workers in the industry in general, nearly half work in the mechanical and metallurgical industry and over a third in the clothing industry, even though in recent years the latter sector has faced the competition from countries with low-cost labour".

The Italian manufacturing sector, and in general the Italian economy, shows a specific productive tradition. In fact, especially since the Second World War, a new form of model of capitalism, namely small-scale capitalism evolved.

As known, the relationship of the family with the company can have different aspects depending on the type of ownership and governance. When the family holds both ownership and management, then it is a traditional family business; but may be that only the ownership and not governance, or vice versa, is held by the family and then we talk of extended family business, because the company also opens up to external parties.

The Italian production base is, therefore, characterized by a form of small-scale capitalism that integrates traditions, quality, competitiveness and the local communities welfare. In addition, another typically Italian characteristic of doing business consists in taking into account its roots and in raising profile of the local product, by exploiting the local natural and cultural heritage as a competitive asset in the markets. This distinctive feature is expressed by choosing suppliers near the company that positively influence the whole chain. This posture proves a particular attention to the natural environment and to the local community by Italian firms. Yet, Italian manufacturing firms show poor ability to open up. And even when the company is expanding, it does so by maintaining governance control, by preferring the search for new capital for future and more ambitious objectives.

In recent years, many Italian manufacturing companies introduced a new development model capable of supporting growth, by stimulating more even and sustainable economic processes. Simply put, several Italian manufacturing companies assumed sustainability as a new paradigm of development, considering the assessment of performance socially and environmentally. Most Italian companies recognize the importance of the perspective that sees the company as a subject with social and environmental as well as economic responsibilities.

The reasons that lead to introduce eco-compatible production models are numerous. On the one hand, they are linked to binding factors, such as compliance with environmental protection regulations; on the other they are voluntary, although driven by the need to respond to pressure coming from stakeholders with interests sometimes divergent. In fact, the manufacturing sector is characterized by productions that have significant environmental impacts that create social concerns. This is why manufacturing companies implement a series of initiatives for reducing environmental impacts and increasing the use of non-renewable resources. Indeed, this sector is currently among the most proactive in terms of protection of natural heritage and environmental sustainability.

In recent years, Italian SMEs integrated the principles of "green economy" into their strategic policies. The green economy represents one of the many aspects of sustainability that links social and ethical values to those that are more strictly linked to the economic sphere and to that of company competitiveness.

Moreover, based on an ISTAT (2008)⁽¹⁰⁸⁾ research, the manufacturing sector has the greatest attitude to make investments in plants and end-of-pipe equipment, i.e. equipment, installations or devices that act for monitoring and reducing the pollution after it has been generated. These are, for example, filters for the treatment of gaseous wastes; collection of waste and transport networks, plants and equipment for the storage and transport of waste, treatment and/or recovery of waste (including composting), ultimate disposal (for example incinerator burning). Again, these analyses demonstrate a special attention towards the natural environment issues.

As a result of the structural features of Italian manufacturing production base, Italian firms have exploit innovative routes typical of some sectors such as

alternative energy but also adapt to the changes taking place, by introducing new forms of environment-friendliness production.

The data available to UnionCamere and the Symbola Foundation⁽¹⁹⁸⁾ show that in Italy almost half of the manufacturing SMEs adopts investments in products and technologies with greater energy savings and/or lower environmental impacts as strategies of production organisation. The trend regards larger SMEs, but also the smaller ones.

The role of eco-efficiency is fundamental for corporate strategies, not only on the basis of the organizational dimension of the company, but also at the sectorial level. In fact, the spread of green economy is virtually the same in the food, clothing and furniture sectors as well as in the mechanical sector. Moreover, also territorially, the green economy is distributed more or less equally, with a slightly higher incidence in the South of Italy.

The studies carried out by industrial associations show how the integration of green technologies in Italian manufacturing production is extended to an increasingly large business elite that recognizes in the green economy a lever both to renew and to improve the market supply, targeting customers increasingly sensitive to environmental issues.

The economic advantages are even more appreciated in terms of turnover: in this case, in fact, the SMEs, which invest in environment-friendliness way, show a greater increase in turnover respect to other firms, which do not. These results are very significant, because they show that the green economy constitute a driving force for boosting the small business also on the international scene. In fact, the green economy has an important effect on exports. However, the competitive effect triggered by the green economy results not only for the external demand, but also for that domestic, confirming that now the awareness of quality, design, innovation and sustainability of green products is emerging, with the upturn in orders, even on the national territory. Furthermore, it is worth noting that SMEs that focus on sustainability also make R&D investments and in the patent field.

The technological innovation linked to the environmental topics appears, therefore, more and more among the first CSR actions implemented by the firms of Italian manufacturing. With the ecological turnaround, markets are more profitable and they can intercept a new demand, especially when "green" innovation is supported by "digital" innovation. In fact, SMEs with a "green" mentality use web technologies more widely to increase sales. The analysis leads us to think that the eco-efficiency and use of Internet represent a twin strategy to increase the opportunities of business.

It's a well-established fact of digital technologies that can significantly contribute to addressing environmental and social responsibilities and simultaneously lead to achieve economic results, for example in terms of higher revenues, lower costs, risk reduction and improvement of company reputation.

Some Italian SMEs are considering a Digital Responsibility by introducing new innovative products and services, such as intelligent systems and sensors for energy saving, and smarter products with a lower environmental impact. Other companies are beginning to apply this potential within their structures starting

from the dematerialization of procedures and traceability, to innovative corporate welfare tools. Furthermore, several companies recognize the importance of ICT instruments to reduce business travel (conference calls) and new forms of remote work (teleworking), as well as the possibility of introducing new systems for measuring energy consumption. Within human resources, a strategy of expanding e-learning opportunities with even advanced tools such as Virtual and Augmented Reality is increasingly pursued. Innovative companies are creating support platforms for their employees and platforms for collecting feedback and proposals from the employees themselves (also organized in teams), for example on how to make the company's activity more environmentally friendly. In many cases these platforms provide for rewards and incentives and a commitment to realizing the most interesting proposals. Instead, digital technologies are underused for health and safety. And it isn't embedded in the relations' management with internal and external stakeholders (for example in terms of analysis of reputation, and employee satisfaction, communication and dissemination and support to business ethics) and particularly regarding the data collection in order to report on social and environmental commitment (for example in social reports, sustainability reports and integrated reports).

Finally, an ISFOL survey (2008)⁽¹⁰⁷⁾ reveals that the most requested skills in the workplace by managers operating in the manufacturing sector are reliability, manual skills and physical and mental health qualities that require specific attention to CSR actions aimed at improving working conditions in terms of health and safety of employees and at enhancing the work environment in general⁽⁴⁹⁾. Therefore, we can conclude that manufacturing companies are experienced in integrating the green economy, the digital responsibility, the human resources management, and safety and workplace protection. This expertise supports the definition of the following research hypotheses:

H1: Firms with a broad involved commitment in CSR initiatives have a greater probability to innovate in product, process.

H2: CSR domains that provide higher probability to innovate in product and process innovations are Work Environment and Employee, and Natural Environment and Local Community.

H3: There are positive correlations between companies' risk-oriented CSR indicators (ESG indicators) and financial performance.

4.4 Methodologies

4.4.1 Sample identification and CSR domains

To test our hypotheses, I used the database connected to Businessethics.it, the Italian platform, which provides information about CSR practices and indicators at the firm level.

The effort to encourage responsible business at regional level leads to developing a mix of compliance requirements and voluntary measures, often difficult to evaluate because of their incomparability. In 2012, the Italian

government (including the Ministry of Economic Development, Labour and Agriculture, the Italian Regions, OECD-Italian National Contact Point and the Italian Institute against accidents in the workplace (INAIL)) started a project aimed at creating a common scheme willing to sustain innovative, socially-responsible-oriented firms. The project, lasted until 2014, produced a simple and useable online checkboard tool, through which SMEs – but also MNEs – can proceed with a self-assessment, obtaining a CSR diagnosis. One of the best results of this tool is to help SMEs to recognise if they are already a CSR oriented company. Very often SMEs are unaware of what they are doing, the so-called “implicit CSR” (Matten and Moon, 2008)⁽¹³¹⁾ or “sunken CSR”. The second result of the Platform is that SMEs, recognising their CSR profile, improve their attractiveness facilitating their involvement in the supply chain of sustainable MNEs. The tool unifies in a unique framework of CSR indicators for MNEs and SMEs, regional standards, INAIL standard⁽¹⁰⁴⁾, GRI-4⁽⁹²⁾, SA8000 certification scheme⁽¹⁷⁷⁾, ISO 26000 Standard⁽¹⁰⁶⁾, OECD Guidelines⁽¹⁴⁷⁾, UN Global Compact principles⁽¹⁹⁹⁾. The proposed Platform is capable of evaluating in depth the positive externalities of business, their social and environmental performances and respect of requirements included in tenders and calls for funding (e.g. the EU funding programme 2014-2020).

The entire system developed helps companies of different sizes to test their CSR areas through material evidence: the Platform provides information for firms suggesting how they can provide “proof” of their CSR behaviour (internal documents, corporate statement, policies etc.); this, in turn helps banks to check the material evidence of a CSR practice. Moreover, the Platform provides concrete indications to banks to find sustainable issues in SMEs (Porter and Kramer, 2006; Porter and Kramer, 2011; Crane et al., 2014)⁽¹⁵⁵⁾⁽⁴⁸⁾.

The main feature of the Platform is to link environmental and safety issues to the concept of risk. Risk analysis, indeed, cannot forget indicators affecting the natural environment or health & safety, according to the sector of activity. An assessment that does not take into account environmental and social aspects might not work out if a company has managed its own risk well. In fact, actions related to ethical and sustainable business processes at higher risk might either:

- limit the risks of the event that cause a negative impact on cash flow, such as a fine or other penalty tax, economic fine or temporary interdiction;
- limit the possibility of abandonment of the company, by some of its strategic partners;
- limit forms of contrast (boycott).

As regards information taken from the Platform, data of about 3,000 companies were retrieved by (1) the Italian CSR Platform of indicators (developed by the Italian government in order to map companies’ CSR actions and to recognise CSR practices in terms of signs of credit capability, value

production and company's riskiness with the policy stimulus of national calls that awards companies reaching a minimum level of CSR); and by (2) the "AIDA Bureau Van Dick European database", containing all the balance sheets and economic/financial indicators of European large companies and SMEs.

The database employed for the analyses is part of a wider database, which involves Italian firms belonging to the agrifood, manufacturing, pharmaceuticals, services (finance, banking, commerce), and utilities sectors. The database, gathered by online check board tool on a voluntary basis, includes more than three thousand among micro, small, medium and large sized firms. Starting from this population, I built a sample of 167 medium-sized firms (according to the European definition). As discussed above, I chose to focus the attentions on the manufacturing sector as a consequence of remarks revealed in the earlier sections; accordingly the firms' sample extracted belongs to the manufacturing sector.

Specifically, this sector includes textile, mechanical, electronic and construction industries which are subject to social and environmental impacts unlike companies operating in the tertiary and services sector. Indeed, those have a long supply chain and keep indirect contacts with the raw and semi-finished material suppliers. The intermediary buyers monitor the productions that take place in the country having inadequate protection of human rights and insufficient laws in the area of environmental protection.

Data, collected through the platform, allowed us to extract information about CSR efforts and represent them according to stakeholder-related domains.

Our data describe CSR efforts according to the domains identified by Perrini et al. (2011)⁽¹⁶²⁾ plus one more, typical of our data collection scheme:

- Business Organization and Administration (governance and business model). This domain concerns the rules by which the firms are managed and includes the relationship between management and shareholder.
- Work Environment and Employee. This domain refers to procedures aimed at safeguard safety and health, turnover and contracts, training, equal opportunities and salary, gender and diversity, crisis management in the workplace.
- Customer. This domain covers issues related to guarantees, social inclusion, protection and safety, information and sustainability.
- Supplier. This domain includes issues regarding inclusion and social cohesion, sustainability, human rights' risk assessment.
- Natural Environment and Local Community and relation with the Public Government. This domain deals with energy efficiency and renewables, recycling and wastes, packaging and cooperation with Public Administration and Third Sector.
- Management of major specific risks. This domain concerns relevant major risk KPI in:
 - Agrifood industry
 - Building, manufacturing

- Pharmaceutics
- Services: Finance, banking, commerce
- Utilities.

The database contains also information about the innovative behaviour of the firms.

In order to perform the analyses and establish whether a firm implements CSR actions in a specific domain, I built one binary variable for each domain (two for both Work Environment and Employee and Natural Environment and Local Community domains). Each variable takes values of 1 corresponding to “yes, CSR action is implemented” or 0 corresponding to “not, CSR action isn’t implemented” according to the firm has or has not the total indicator for the domain greater of the threshold value. The total indicator for each domain is computed summing all sub domain values, composing the whole domain (for example administration, policies, organization and financial management within the governance and business model domain), whereas the threshold value for domain is the 66-percentile of all total indicators for domain of the sample of firms.

In order to test our first hypothesis, using the firms’ sample described above, I carried out a hierarchical cluster analysis for partitioning the firms in relation to stakeholder groups to which primarily they direct their CSR initiatives. Second, I used the clusters for developing a bivariate probit model, which takes into account the tie between CSR clusters and technological innovation (product and/or process).

Instead, for verifying the second hypothesis, I developed a bivariate probit model connecting the product and process innovations to multiple explanatory variables, i.e. all variables deduced by CSR domains included in the database.

Finally, for proving whether the third hypothesis is verified or not, from all ESG Platform criteria I extracted only a few KPIs that, more than others, show the risk profile of the company, from the operative and managerial perspective. Then, I carried out a qualitative analysis, making use of the support of focus groups and Delphi methodology with a sample of qualified witnesses taken from 4 large international banks, 3 public administrations, 10 listed enterprises, 20 SMEs of the main sectors and 2 universities. This research found 27 ESG KPIs operational-risk related, that are reported in Table 1 (ALTIS-DOGE et al., 2015)⁽⁷⁾. Then, I conducted a cluster analysis in order to investigate the relationships between Corporate Social Responsibility (CSR) indicators and financial performances, using a multiple linear regression analysis performed among the indicators.

Table 1: ESG KPIs operational-risk related.

Safety at work
<i>1. Safety initiatives, in addition to legal obligations according to models of integrated prevention (SGS). (e.g. Whistleblowing).</i>
<i>2. Rate in the year of at least 1 training course in the field of health and safety at</i>

<i>work, in addition to those required by law, specific to its productive sector.</i>
<i>3. Realisation of new best practices to improve the health and safety at work validated by Public Administration & Ministry of Labour & Social Policy.</i>
<i>4. Contract clauses about compulsory reporting and collection of injuries of contractors and subcontractors (for activities carried out within his/her production process) and taking it into account the identification of the measures of prevention and protection. Such provisions shall be systematic and methods of data collection should be formalised in some way, for example with a procedure (including IT one).</i>
<i>5. Design and/or construction and/or purchase of ergonomic work tools, with the cooperation of employees and unions.</i>
<i>6. Voucher or medical benefits for diseases in risk and related to activities, beyond the legal obligations.</i>
<i>7. The company use, for scheduled maintenance of equipment, machinery or plant, a company specialised in specific equipment, machinery and equipment.</i>
<i>8. Monitoring plan and instrumental improvement compared to the current regulations, on exposure levels of workers to one or more chemical, physical and biological systems through automated monitoring or through the assignment of monitoring, with specific contract or specialised companies.</i>
<i>9. Using healthy building materials</i>
<i>10. Adoption of a procedure for the systematic collection and analysis of information about malfunctions and/or on the breakdowns that occurred on machines, systems and individual equipment.</i>
Governance, communication
<i>11. Presence of CSR manager (Possibly independent or subordinate only to BOD or CEO).</i>
<i>12. Presence of environmental report and/or social or integrated reporting <IR>.</i>
<i>13. Presence of company on open platforms of discussion (Internet forum web blogs, if moderated) or Improvement in relations with outside world, as part of collaboration for innovation; or projects with universities and other research organisations.</i>
Environment & waste
<i>14. Monitoring of Energy consumed, % energy used from renewable sources, rate of energy consumption, rate of renewable energy consumption (scoring if there is an improvement compared to previous year).</i>
<i>15. Installation of devices that allow savings in water, energy, and/or reducing direct/indirect emissions.</i>
<i>16. Rating of consumption and CO₂ impacts, water, other emissions and fuel consumption; energy emissions produced Score when improved compared to previous year.</i>
<i>17. Packaging recovery or other forms of saving on materials and energy produced at customers, in addition to legal obligations. (scoring if there is an improvement compared to previous year).</i>

<i>18. Plan to reduce packaging.</i>
<i>19. Use of eco-packaging.</i>
Compliance & certifications
<i>20. Presence of requirements of "Rating of Legality" Antitrust (advanced level, two stars).</i>
<i>21. Presence of anti-corruption procedures or "Protocol legality" Prefecture agreements with "Third Sector" or Anticorruption Plan.</i>
<i>22. Application of HSE rules in foreign branches.</i>
<i>23. % of suppliers that have adhered to standards and participation in networks, ISO26000 and SA8000 and Global Compact (scoring if there is an improvement compared to previous year).</i>
<i>24. UNI ISO 14001 application.</i>
Supply chain
<i>25. Presence of sustainable suppliers (Minimum level of no. of suppliers: 25% in large companies, 20% in medium enterprises; 10% in small businesses) or evaluation of the most important suppliers (those with greater impact on the value chain).</i>
<i>26. Monitoring of compliance, from suppliers, of their code of conduct or plan for human rights, through visits to the suppliers themselves, interviews with managers and employees.</i>
<i>27. Definition of fair contractual terms, such as reduction of prices charged by manufacturers, reducing delivery times, just-in-time to eliminate cost of inventory management, penalties for delays in deliveries etc., provided to specifically prevent the adoption of such practices as:</i> <ul style="list-style-type: none"> • <i>Setting of excessive hours during periods of peak demand;</i> • <i>Remuneration under minimum defined in national legislation;</i> • <i>Objectives of production to meet other urgent deliveries;</i>
<i>Opposition to the establishment of trade unions, to prevent workers from asserting their rights.</i>

4.4.2 Hierarchical cluster analysis

A broad definition of clustering can be given, as “cluster analysis is a technique to partition a set of objects into clusters, in such a way that the profiles of objects in the same cluster are very similar and the profiles of objects in different clusters are quite distinct”. (Statistics Toolbox User’s Guide, 2001)⁽¹³⁰⁾.

I carried out a hierarchical cluster analysis in order to detect homogenous groups of firms.

I decided to adopt the hierarchical clustering procedure, falling into category called agglomerative clustering, that starts considering each observation (i.e. firm) as an individual cluster. Then these clusters sequentially are merged according to their similarity. Agglomerative clustering assigns additional observations to

clusters as the cluster size increases. This allows a hierarchy of clusters to be established from the bottom up.

For evaluating the similarity between clusters one can employ several measures of similarity. I decided to use the *city-block distance*, which allows computing the distance between two generic observations A and B as follows:

$$d_{\text{city-block}}(A, B) = |x_A - x_B| + |y_A - y_B|$$

The choice of the measure of similarity is driven by the nature of the data, in fact qualitative data fits nicely with this type of measure.

Additionally, when using agglomerative hierarchical clustering, it needs to specify a clustering algorithm. There are different linkage algorithms that can be distinguished by the way they define the distance from a newly formed cluster to a certain object, or to other clusters in the solution. I applied linkage algorithm called average linkage that defines the distance between two clusters as the average distance between all pairs of the two clusters' members.

4.4.3 Econometric models

4.4.3.1 Linear regression models

In order to establish whether a certain phenomenon, i.e. social responsibility, affects effectively another one, i.e. financial performance, through the verification of causality, the most commonly used method is linear regression model. Therefore, the relationship can be represented as follows

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_n X_{ni} + \varepsilon_i$$

where i represents the number of observations, namely of the firms included in the sample;

X_1 is the indicator of the social responsibility;

X_2, \dots, X_n are potential control variables, meaning other factors that contribute to the achievement of the corporate results (corporate internal features and external related to the relative sectors and to the reference markets, as well as aspects linked to the settlement context;

ε is the error, the residual of the estimation, that is to be minimized by means of regression method, through the proper estimation of the β coefficients

By studying a relationship such specified I used multiple linear regression method based on Ordinary Least Square (OLS). This assigns to parameters of relationship those values that minimize the square of distances between available observations and the corresponding regression curve; such distances are the residuals ε_i .

4.4.3.2 Models for binary outcomes: the statistical model

One of the most efficient models for establishing whether a set of variables has effects on the choice to innovate is a probit model, which is standard in empirical studies that handle firm behaviour.

One way for deriving the probit regression model consists in hypothesizing a latent variable and a measurement model linking the latent variable to binary outcome.

Another way is constructing a probability model. That is the probit regression model can be derived without appealing to a latent variable, instead by specifying a nonlinear model relating the x 's to the probability of an event.

Therefore the model is constructed forcing the predicted $\Pr(y = 1 | x)$ to be within the range 0 to 1. For example, in the linear probability model

$$\Pr(y = 1 | x) = x \cdot \beta + \varepsilon$$

The predicted probabilities can be greater than 1 and less than 0. To constrain the predictions to the range 0 to 1, functions of $x \cdot \beta$ that range from 0 to 1 are to be chosen. The cdf for the standard normal distribution results in the probit model.

The probit regression with a single regressor X is:

$$\Pr(Y = 1 | X) = \Phi(\beta_0 + \beta_1 \cdot X)$$

with Φ : Cumulative distribution function of the standard normal.

For a non-linear model, interpreting the coefficient values is very difficult because they affect the probability of innovating through the $-z$ values, therefore for understanding the results it is more intuitive introduce the marginal effects.

As Cameron and Trivedi (2010: 343)⁽²⁷⁾ maintain, "A marginal effect (ME), or partial effect, most often measures the effect on the conditional mean of y of a change in one of the regressors, say, x_j . In the linear regression model, the ME equals the relevant slope coefficient, greatly simplifying analysis. For nonlinear models, this is no longer the case, leading to remarkably many different methods for calculating MEs."

Briefly marginal effects show the change in probability when the predictor or independent variable increases by one unit. For continuous variables this represents the instantaneous change given that the 'unit' may be very small. For binary variables, the change is from 0 to 1, so one 'unit' as it is usually thought.

There are three types of marginal effects, which we can calculate: MEMs (Marginal Effects at the Means), AMEs (Average Marginal Effects) and MERs (Marginal Effects at Representative values).

When we compute the MEMs, we compare two average enterprises, defined introducing, in the model, the mean value for all independent variables.

In the AMEs case, all of the data is being used, not just the means, and this could lead to think to have superior estimates. However the two approaches define averages, which can hide difference in effects across cases.

MERs (Marginal Effects at Representative Values) may therefore often be a superior alternative. In fact, they show how the effects of variables vary by other CSR behaviours of the firm. With MERs, we set the values for one variable, and then see how the marginal effects differ for these values.

The bivariate probit model is a joint model for two binary outcomes. These outcomes may be correlated, with correlation ρ .

Marginal effects for the joint probability and predicted values can be estimated similarly to those for the binary probit models.

Chapter 5

Clustering validation, hypothesis testing and results discussion

5.1 Introduction

This chapter deals with measures aimed to evaluate the “goodness” of the resulting clusters, but also with those aspects of econometric models regarding estimation, hypotheses test. Next, the results are interpreted and discussed.

5.2 Cluster analysis

5.2.1 Variables and measures

In order to test our first hypothesis, using the firms’ sample described above, I carried out a hierarchical cluster analysis based on eight variables operationalizing the CSR domains identified, for detecting homogenous groups of firms in relation to stakeholder groups to which primarily they direct their CSR initiatives. Second, I used the clusters for developing a bivariate probit model, which takes into account the tie between CSR clusters and technological innovation (product and/or process). The domains concerned and corresponding variables are reported in Table 2.

Table 2: List of variables used for cluster analysis.

Variables	Description
csr_busorg	Business Organization and Administration (governance and business model)
csr_worken	Work Environment

csr_empl	Employee
csr_cust	Customer
csr_supp	Supplier
csr_natenv	Natural Environment
csr_locom	Local Community
csr_manrisk	Management of major specific risks

Each variable serves to establish the commitment of a firm towards a specific domain. Given that the variables are all dummies, value of 0 means "no, no action implemented in a specific domain" and value of 1 means "yes, action implemented in a specific domain". As consequence, I expect to identify clusters based on the features of firms, in terms of typology and variety of domains covered.

5.2.2 Validation and Interpretation of the Clustering Solution

To guide the decision on the number of clusters, we worked on the distances at which the objects were combined. More precisely, we searched for a solution in which an additional combination of clusters or objects occurred at a greatly increased distance. We achieved this task by plotting the distance level at which the mergers of objects and clusters occurred on the dendrogram generated from our sample. Figure 6 shows the cluster tree or dendrogram and points out the arrangement of the clusters produced by hierarchical clustering. Further, it suggests the possibility of partitioning firms' sample into two clusters.

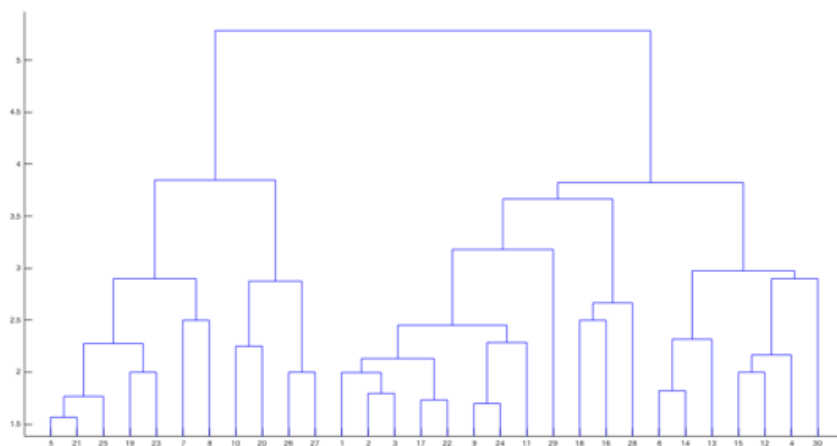


Figure 6: Hierarchical clustering dendrogram for sample under investigation.

To verify that the hierarchical cluster tree represents significant similarity groupings, I used the cophenetic correlation coefficient. This parameter evaluates the correlation between the linking of objects in the cluster tree and the distances between objects in the distance vector. Furthermore, the closer the value of the cophenetic correlation coefficient is to 1, the better the cluster formation.

Actually, I found that the combination city-block distance/average linkage returned the most high cophenetic correlation coefficient (equal to 0.8029) what confirmed the choice regarding the algorithm in combination with the distance selected.

For interpreting the two clusters identified, I studied the cluster centroids that are the clustering variables' average values of all firms in a cluster.

The results of the cluster analysis indicate briefly that the mean of each variable for each cluster it is significantly higher in the cluster 2 (CLS2) (see Table 3)

Table 3: CSR clusters.

CLUSTER		csr_busorg	csr_worken	csr_empl	csr_cust	csr_supp	csr_natenv	csr_locom	inno	csr_manrisk
1	Mean	0,08	0,14	0,18	0,26	0,23	0,23	0,59	0,22	0,16
		9	16	20	30	26	26	67	25	18
2	Mean	0,92	0,83	0,91	0,70	0,70	0,72	0,81	0,72	0,74
		49	44	48	37	37	38	43	38	39

In terms of the number of the various CSR domains involved, it's worth noting that a quarter of firms belonging to the CLS2 works on eight domains and another quarter turns one's attention to all CSR management domains. The results change when we observe the firms belonging to the cluster 1 (CLS1). In fact, among CLS1 firms, only 0.01% fills seven domains, and zero is on eight or nine areas (see Figure 7).

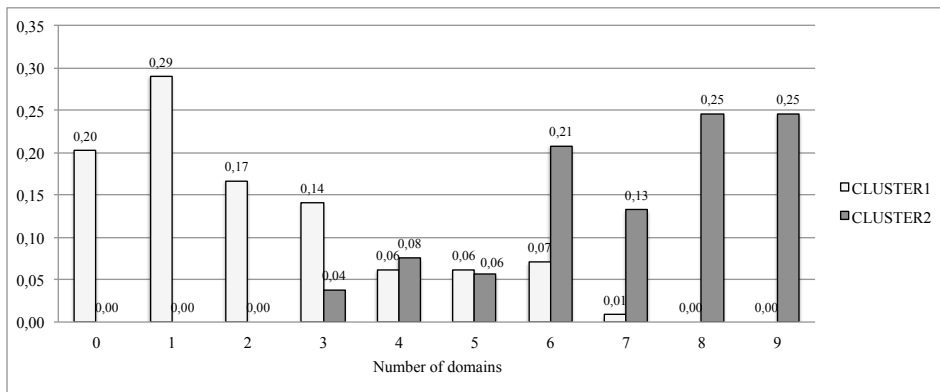


Figure 7: Relative frequencies of the number of the various CSR domains in which firms operate.

Briefly, Figure 8 shows that 83% of CLS2 firms acts on a number of domains equal or greater than to six, whereas only 20% of firms included in the cluster 1 are active in four or more than four fields.

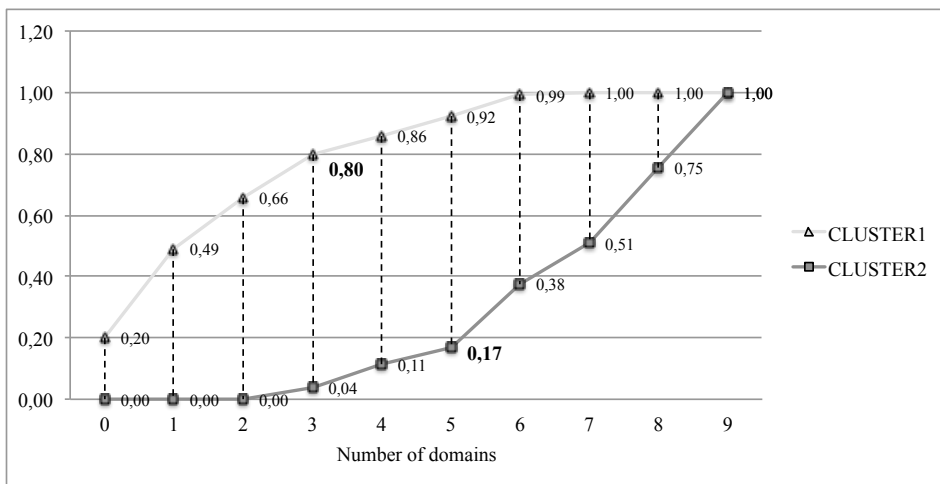


Figure 8: Cumulative frequencies of the various CSR domains in which firms operate.

With respect to the intensity of the various CSR practices adopted, it's worth noting that 92% and 91% of firms belonging to the cluster 2 achieve practices within the Business Organization and Administration and Employee domains respectively, whereas an important percentage (81%) decides to invest the own efforts in the Local Community field. Furthermore, 72% of the same group pays attention to the initiatives concerning Natural Environment and Innovation.

The interest of the firms of the cluster 1 for the Local Community domain remains. In fact 59% carries out actions regarding that domain, but, in contrast, only 8% of the CLS1 firms are interested about Business Organization and Administration actions (Figure 9).

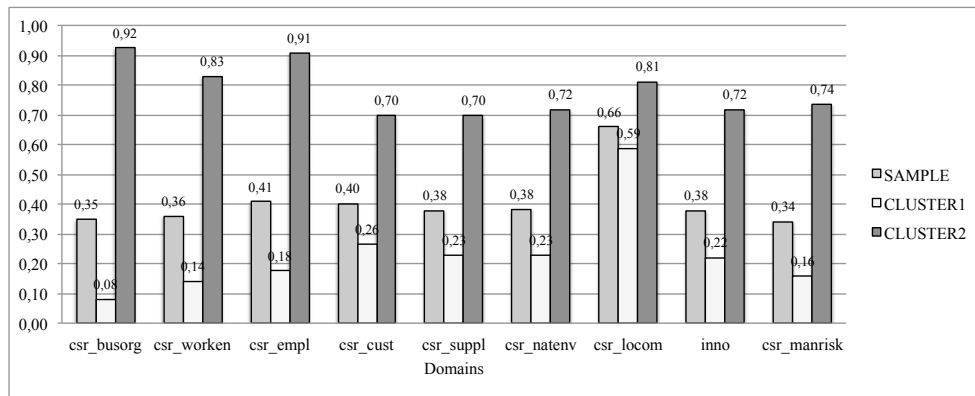


Figure 9: Frequency distribution of CSR domains in which firms adopt initiatives.

Overall the findings show that the ‘average commitment’ characterising the firms of cluster 1 is poor both in terms of number of CSR domains towards which these firms direct their initiatives and variety of the various CSR domains they undertake. There is a suggestion that the companies belonging to cluster 1 interpret their own stakeholders as non-supportive subjects. As consequence, they assume a defensive posture and reduce the interactions because they imagine limited opportunities of collaborating and high levels of risk.

If on the one hand firms of the cluster 1 present little awareness for all domains, on the other hand most firms belonging to cluster 2 are active on eight domains, even if they demonstrate special interests for those domains related to the internal stakeholder groups towards which they seem be open-minded.

It seems that the firms of cluster 2 recognise these stakeholders as supportive subjects that express, potentially, strong opportunities of cooperation but also sources of threat. Therefore their posture is collaborative.

It’s worth noting that the only common aspect between the two groups is the commitment in initiatives regarding the Local Community field that still represents a primary stakeholder for all companies engaged in CSR practices.

However, if we analyse the firms behaviour of two clusters with regard to the Innovation field, we can observe that 72% of the CLS2 firms embraces innovative practices, while in contrast only 22% of the firms belonging to the cluster 1 adopts conducts favouring the innovation (Figure 9).

Furthermore, it’s worth highlighting that 38% of the firms of the selected sample achieve CSR actions within the Innovation field (Figure 4), and 60% of this rate belongs to the cluster 2 (Figure 10).

In addition, a result remarkable regards the behaviour of cluster 1 in relation to Local Community domain. In fact, for all domains the share of firms of cluster 2 exceeds that of cluster 1, expect that for the domain earlier mentioned. This finding confirms the strong commitment by firms poorly engaged in implementing CSR initiatives.

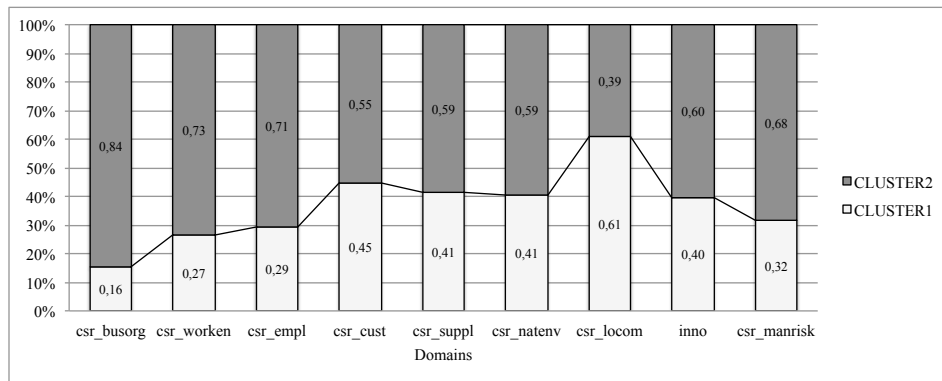


Figure 10: Frequency distribution of CSR domains within each field.

In addition, a result remarkable regards the behaviour of cluster 1 in relation to Local Community domain. In fact, for all domains the share of firms of cluster 2 exceeds that of cluster 1, except that for the domain earlier mentioned. This finding confirms the strong commitment by firms poorly engaged in implementing CSR initiatives.

5.3 Probit models

5.3.1 Probit estimation analysis

5.3.1.1 Dependent and independent variables: Two types of technological innovation and commitment-based CSR clusters

The second step necessary to test our first hypothesis consists in developing a bivariate probit model, which takes into account the tie between CSR clusters and technological innovation (product and/or process).

The two dependent variables, product and process innovations, come from the database derived by the survey carried out through the online checkboard tool. The Innovation domain contains 47 items, which permit to understand whether a firm introduces a new or substantially improved product or process by which good or services are created or delivered. Furthermore, the database structure allows us to establish whether different processes are adopted through substantial modifications in the modes by which goods or services are made or offered; the measure distinguishes between processes new for the business or for the sector.

To understand the impacts of each CSR cluster, I introduced the two commitment-based CSR clusters came from the previous partitioning operation (CLS1 and CLS2), which represent our independent variable. Table 4 includes the definitions of these variables.

Table 4: Dependent and independent variables used for probit models and bivariate probit model, with a single regressor.

Variables	Description
Depvar: inno_prod	Product innovation: the firm inserts new or substantially enhanced goods

Depvar: inno_proc	Process innovation: the firm inserts new or substantially enhanced systems of making or producing goods or services
Indepvar: cluster	=0 “Firms with poor involved commitment” =1 “Firms with ample involved commitment”

5.3.2 Hypothesis testing and interpretation of the model

When the assumptions of the model are valid, the estimates derived by probit model are distributed asymptotically normally:

$$\hat{\beta}_k \sim N(\beta_k, \sigma_{\beta_k}^2)$$

The hypothesis $H_0: \beta_k = \beta^*$ can be tested with the z-statistic:

$$z = \frac{\hat{\beta}_k - \beta^*}{\hat{\sigma}_{\hat{\beta}_k}}$$

Under the assumptions justifying Maximum Likelihood, if H_0 is true, then z is distributed approximately normally with a mean of zero and a variance of one for large samples. This is shown in the following figure:

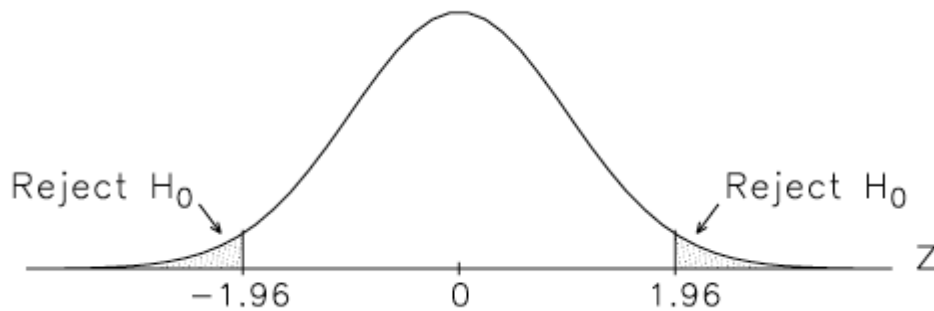


Figure 11: Rejection region for a two-tailed test at the .05 level⁽¹²⁴⁾

Handling the data within the software STATA, I estimated the two probit regression models. They result inserting the component of product and process innovation as dependent variable and a single regressor, named cluster differentiating the commitment.

$$Pr(inno_{prod} = 1) = \Phi(\beta_0 + \beta_{cluster} \cdot cluster)$$

$$Pr(inno_{proc} = 1) = \phi(\beta_0 + \beta_{cluster} \cdot cluster)$$

The Table 5 shows the results obtained:

Table 5: Coefficient estimation for probit model, with a single regressor, of inno_prod.

inno_prod	Coef.	Std. Err.	z	P> z	[95% Interval]	Conf.
cluster	1.008344	.2174919	4.64	0.000	.5820679	1.43462
_cons	-.745217	.1300329	-5.73	0.000	-1.00007	-.490357

Table 6: Coefficient estimation for probit model, with a single regressor, of inno_proc.

inno_proc	Coef.	Std. Err.	z	P> z	[95% Interval]	Conf.
cluster	1.182087	.2207411	5.36	0.000	.7494423	1.614731
_cons	-.716497	.1290181	-5.55	0.000	-.969368	-.463626

The findings shown in the Table 5 and Table 6 suggest the conclusion that being firm strongly engaged in initiatives CSR has a significant effect on the probability of innovating in product, process (z = 4.64; and 5.36 respectively; p < 0.01 for a two-tailed test).

Table 7: Coefficient estimation for probit models, with a single regressor, of inno_prod and inno_proc.

Inno_prod	cluster	1.008
		(4.64)**
	_cons	-0.745
		(5.73)**
N		167
Inno_proc	cluster	1.182
		(5.36)**
	_cons	-0.716
		(5.55)**
N		167

* p<0.05; ** p<0.01

As mentioned above, since the probit model is nonlinear, there isn't a unique approach for interpreting completely the relationship between a variable and the outcome. In general, the estimated parameters from the probit model do not offer directly useful information for explaining the relationship. Yet, for any set of values of the independent variables, the predicted probability can be computed.

The Table 8 shows that the predicted probabilities in the sample vary from 0.228 to 0.604, with a mean predicted probability of innovating in product of

0.347. Whereas, the process innovations predicted probabilities vary from 0.237 to 0.679, with a mean of 0.377.

Table 8: Probit models with a single regressor: predicted probabilities of inno_prod and inno_proc.

variable	Obs	Mean	Std.Dev	Min	Max
Prob1 (inno_prod)	167	.3473054	.1753974	.2280702	.6037736
Prob2 (inno_proc)	167	.3772455	.2065363	.2368421	.6792453

In particular I compute the discrete change when the independent variable increases of one unit. From a real perspective, this means following the predicted probabilities for evaluating the effects related to the case in which a firm passes from cluster 1 (firms with poor involved commitment) to cluster 2 (firms with ample involved commitment).

The results show that varying cluster from its minimum of 0 to its maximum of 1 increases the predicted probability of innovating in product from 0.23 to 0.60, an increase of 0.37. On the hand of predicted probability of innovating in process, the change has a greater effect. In fact, the predicted probabilities pass from 0.24 to 0.68, with an increase of 0.44.

Table 9: Probit model with a single regressor: changes in predicted probabilities of inno_prod.

	Min->Max	0->1	+1/2	+sd/2	MargEfct
cluster	0.3757	0.3757	0.3551	0.1703	0.3675
	No_inno	Yes_inno			
Pr(y x)	0.6647	0.3353			
	cluster				
x	.317365				
Sd(x)	.466851				

Table 10: Probit model with a single regressor: changes in predicted probabilities of inno_proc.

	Min->Max	0->1	+1/2	+sd/2	MargEfct
cluster	0.4424	0.4424	0.4230	0.2054	0.4449
	No_inno	Yes_inno			
Pr(y x)	0.6336	0.3664			
	cluster				
x	.317365				
Sd(x)	.466851				

5.4 Bivariate probit models

5.4.1 Bivariate probit estimation analysis using a single regressor.

5.4.1.1 *Dependent and independent variables: two types of technological innovation and commitment-based CSR clusters*

In the previous section, I estimated a probit model for each type of innovation (product and process), which consider the probability that a firm adopts each type of innovation. Yet, the choices to implement product innovation and process innovation are mutually affected. Therefore, process and product innovations are interrelated decisions, and it is interesting to understand the combined effects of both innovations under investigation (Rouvinen, 2002)⁽¹⁷⁵⁾. Therefore, I estimated a bivariate probit model (see Table 11) to evaluate the potential relationship between the CSR clusters and the two innovations. This type of analysis is uncommon, in fact most studies work on a single type of innovation (Weiss, 2003)⁽²¹¹⁾.

For the bivariate probit model, I use the same variables, obtaining the coefficient estimate through marginal effects on the probability of innovating. I performed a statistical test that confirms the link of the two cases considered. Furthermore, the correlation coefficient supports the interdependence (see Table 11).

5.4.1.2 *Estimation and interpretation of the model*

The bivariate probit models permit of studying if the cluster affects the joint outcome of innovating in product (inno_prod) and process (inno_proc).

The model estimated results:

$$Pr(inno_{prod} = 1, inno_{proc} = 1) = \phi(\beta_0 + \beta_{cluster} \cdot cluster)$$

The mean (proportion) for innovation in product (inno_prod) is 0.35 and the mean (proportion) for innovation in process (inno_proc) is 0.38. The correlation is 0.4702, that suggests the opportunity to apply bivariate probit).

Table 11: Coefficients estimation for bivariate probit model, with a single regressor, of inno_prod, inno_proc.

	Coef.	Std. Err.	z	P> z	[95% Interval]	Conf.
Inno_prod						
cluster	1.00677	.2178636	4.62	0.000	.5797648	1.433774
_cons	-.742571	.1295849	-5.73	0.000	-.996553	-.488590
Inno_proc						
cluster	1.183428	.2211938	5.35	0.000	.7498957	1.61696
_cons	-.714071	.1285963	-5.55	0.000	-.966115	-.462027

/athrho	.6666678	.1545374	4.31	0.000	.3637802	.9695555
rho	.5827837	.1020508			.3485393	.7485089

LR test of rho=0: chi2(1) = 21.5002 Prob > chi2 = 0.0000

Table 12: Bivariate probit model with a single regressor: predicted probabilities of inno_prod and inno_proc.

Variable	Obs	Mean	Std.Dev.	Min	Max
Inno_prod	167	.3473054	.4775457	0	1
Inno_proc	167	.3772455	.4861549	0	1
Biprob1	167	.3479826	.1752164	.2288705	.6041862
Biprob2	167	.3781846	.2068153	.2375914	.6805924
Biprob00	167	.5139884	.2050629	.214143	.6533902
Biprob01	167	.138029	.0298465	.1177393	.1816708
Biprob10	167	.107827	.0017524	.1052646	.1090183
Biprob11	167	.2401556	.1769689	.1198521	.4989216

Table 13: Bivariate probit model with a single regressor: marginal effects at means.

	Delta method				
	dy/dx	Std. Err.	z	P> z	[95% Conf. Interval]
cluster	.3412148	.0614965	5.55	0.000	.2206839 .4617456

The marginal effect, computed using STATA software, indicates that a firm spending scarce commitment in CSR initiatives might increase its probability to innovate in product and process, if it modified its posture extending its commitment.

The results confirm our hypothesis and give us a measure of the improvement of the joint probability in connection with the clusters identified and their strategies. The findings confirm that the firm that keeps an ample involvement in CSR practices has a joint probability of innovating higher than a firm with a poor attitude.

5.4.2 Bivariate probit estimation analysis using multiple regressors

5.4.2.1 Dependent and independent variables: two types of technological innovation and CSR domains

For verifying the second hypothesis, I developed a bivariate probit model connecting the product and process innovations to multiple explanatory variables, i.e. all variables deduced by CSR domains included in the database.

Table 14: Dependent and independent variables used for bivariate probit model with multiple regressors.

Variables	Description
Depvar: inno_prod	Product innovation: the firm inserts new or substantially enhanced goods
Depvar: inno_proc	Process innovation: the firm inserts new or substantially enhanced systems of making or producing goods or services
Indepvar: csr_busorg	Business Organization and Administration (governance and business model)
Indepvar: csr_worken	Work Environment
Indepvar: csr_empl	Employee
Indepvar: csr_cust	Customer
Indepvar: csr_supp	Supplier
Indepvar: csr_natenv	Natural Environment
Indepvar: csr_locom	Local Community
Indepvar: csr_manrisk	Management of major specific risks

5.4.2.2 Estimation and interpretation of the model

After the development of the two probit models and of the bivariate model with a single predictor, I carried out an additional analysis considering a bivariate probit model that includes all binary variables generated from CSR domains. The aim of this analysis consists in investigating the effect that each variable has on the joint probability of innovating. Thus it serves to support the hypothesis, derived from the context analysis, that the higher contribution to combined product and process innovations fall under the subject of community, environment, human resources management, and safety and workplace protection. Furthermore, the analysis allows establishing which action may be convenient to activate before the others, in order to gain the maximum advantage.

Using the same sample, I estimated the model:

$$Pr(\text{inno}_{\text{prod}} = 1, \text{inno}_{\text{proc}} = 1) = \phi(\beta_0 + \beta_{\text{busorg}} \cdot x_{\text{busorg}} + \beta_{\text{worken}} \cdot x_{\text{worken}} + \dots + \beta_{\text{manrisk}} \cdot x_{\text{manrisk}})$$

Table 15: Coefficients estimation for bivariate probit model, with multiple regressors, of inno_prod, inno_proc.

	Coef.	Std. Err.	z	P> z	[95% Interval]	Conf.
Inno_prod						
csr_busorg	-.133477	.3175422	-0.42	0.674	-.7558481	.4888942
csr_worken	-.1254989	.2994939	-0.42	0.675	-.7124961	.4614983
csr_empl	.7736555	.2785769	2.78	0.005	.2276548	1.319656
csr_cust	.815048	.278397	2.93	0.003	.2693998	1.360696
csr_supp	.3643908	.3067108	1.19	0.235	-.2367513	.9655328
csr_natenv	.4435098	.2571525	1.72	0.085	-.0604998	.9475193
csr_locom	-.0552815	.269762	-0.20	0.838	-.5840054	.4734423
csr_manrisk	.1458325	.2862483	0.51	0.610	-.4152038	.7068689
_cons	-1.39526	.2306695	-6.05	0.000	-1.847364	-.9431566
Inno_proc						
csr_busorg	.5319925	.2971573	1.79	0.073	-.0504251	1.11441
csr_worken	-.0599396	.2909268	-0.21	0.837	-.6301456	.5102664
csr_empl	.6388619	.2699718	2.37	0.018	.1097269	1.167997
csr_cust	.3352191	.2818988	1.19	0.234	-.2172924	.8877306
csr_supp	.3378711	.3188093	1.06	0.289	-.2869838	.9627259
csr_natenv	.635358	.2659459	2.39	0.017	.1141136	1.156602
csr_locom	-.6299239	.2718354	-2.32	0.020	-1.162711	-.0971362
csr_manrisk	.1742866	.2915725	0.60	0.550	-.397185	.7457581
_cons	-.9790168	.2095372	-4.67	0.000	-1.389702	-.5683314
/athrho	.5295197	.170253	3.11	0.002	.1958299	.8632094
rho	.4850138	.1302029			.1933644	.6979075

LR test of rho=0: chi2(1) = 10.6835; Prob > chi2 = 0.0011

Table 16: Bivariate probit model with multiple regressors: predicted probabilities of inno_prod and inno_proc.

Variable	Obs	Mean	Std.Dev.	Min	Max
Inno_prod	167	.3473054	.4775457	0	1
Inno_proc	167	.3772455	.4861549	0	1
Biprob1	167	.3459206	.2721738	.0436775	.8330769
Biprob2	167	.3790054	.2788828	.0475706	.8996243

Biprob00	167	.5150835	.2997539	.0607751	.9074185
Biprob01	167	.1389959	.0923528	.0350733	.4727898
Biprob10	167	.1059111	.0791147	.0141772	.3628628
Biprob11	167	.2400096	.2404924	.0124972	.7437563

I computed marginal effects for the multiple bivariate model discovering that the influencing factor which prevails over the others is in the Employee domain, followed by Customer and Natural Environment fields. In fact, when a firm adopts initiatives in those fields, that is when *csr_empl*, *csr_cust*, and *csr_natenv* increase by 1, the probability $P(\text{inno_prod}=1, \text{inno_proc}=1)$ of a firm innovating in product and process increases by 20%, 17%, and 15% respectively.

The results tell us that, if we had two otherwise-average enterprises, one not implementing actions in Employee domains, and the other implementing, the probability of innovating in product and process would be 20% higher for that firm which adopts practices. Average is defined as having the mean value for the other independent variables in the model, i.e. 34.73% Business and Organization actions implementer, 35.93% Work Environment actions implementer and so on.

Table 17: Bivariate probit model with multiple regressors: marginal effects at means.

	P(inno_prod=0, inno_proc=0)	P(inno_prod=0, inno_proc=1)	P(inno_prod=1, inno_proc=0)	P(inno_prod=1, inno_proc=1)
csr_busorg	-.0998386	.1462598	-.0956334	.0492121
csr_worken	.0390495	.0045971	-.0170257	-.0266209
csr_empl	-.3046448	.0355793	.0699055	.19916
csr_cust	-.2407781	-.0426831	.1176073	.1658539
csr_supp	-.1522598	.0255303	.0281147	.0986148
csr_natenv	-.2385049	.0842591	.0050531	.1491928
csr_locom	.1604174	-.1411913	.0710378	-.0902639
csr_manrisk	-.0702065	.0194882	.0061678	.0445505

Moreover, using all of variables enhances understanding of innovation determinants. Actually, this result suggest that the our second hypothesis is confirmed and, further that it could be convenient to activate actions within the Employee domain before any other action in some other domain in order to gain the maximum advantage.

5.5 Identification and interpretation of the linear regression model

5.5.1 Relationships between corporate social responsibility and financial performances

To test our third hypotheses, I used the database connected to Businessethics.it, extracting information for the cases of small, medium and large enterprises.

Cluster analysis is applied in order to investigate the relationships between Corporate Social Responsibility (CSR) indicators and financial performances. In particular, K-Means method has been employed so as to partition firms and companies into k mutually exclusive clusters. As a result, each firm is assigned to one of the k clusters by minimising the distances of all objects in that cluster from the data point to the mean location (centroid) of the cluster. Thus, each cluster in the partition is defined by its centroid that is serving as a prototype of the cluster. It is worth remarking that the K-Means method computes cluster centroids differently depending on the specific distance. In particular, the distance must be effective and adequate for the specific dataset and, in this analysis; I used the city-block distance as that is recommended for classifying variables on ordinal scale.

The cluster analysis was carried out separately for the cases of small, medium and large enterprises of the database.

For each enterprise observation, the “CSR overall indicator” was calculated by summing up the values of the CSR indicators of all areas. This leads to identifying a single concise indicator encompassing all CSR features and performance of each firm.

The dendrogram originated the K-Means method applied to the large-enterprise case of the database used, with the city-block distance points out the arrangement of the clusters produced by hierarchical clustering and suggests the possibility of partitioning large enterprises into two clusters. This is further confirmed by a cophenetic correlation coefficient equal to 0.8636, which measures the statistical confidence for the degree of separation between the clusters. Similar results have been obtained for the cases of small and medium enterprises and allowed us to classify each dimensionally conditioned sub-set of observations into two clusters.

Hence, the average of the “CSR overall indicators” of the centroid of each cluster was calculated together with the main “economic and financial” variables of the centroids using the database introduced in the previous Section and the partitions originated by the clustering. Later, multiple linear regression analysis was performed among the indicators of the centroids and Table 18 shows the correlation coefficients.

Table 18: Correlation coefficient between “CSR indicators” and the main “economic and financial” variables for small, medium and large enterprises.

Economic and financial variables	r(SE) Small Enterp.	r(ME) Medium Enterp.	r(LE) Large Enterp.
TURNOVER	-0.3212	0.0375	0.5538
EXPORT	0.0141	-0.2959	0.9994
AGE	-0.8298	0.4309	-0.3913
EMPLOYEES	0.5741	0.6659	0.5733
BRANCHES	0.9788	-0.8162	0.9586
GENDER	0.1921	-0.6575	-0.9871
PART-TIME EMPLOYEES	0.2481	0.9933	0.7231
LONG TENURED EMPLOYEES	-0.5302	0.4387	-0.3029
CODE OF ETHICS	0.2061	0.9696	0.9996
EBITDA	-0,0129	0.3107	0.5084
EBITDA/SALES	-0.3908	0.0748	-0.0645
ROA	-0.8590	-0.8196	0.9104
ROI	0.0573	0.8899	0.8674
ROS	-0.9240	-0.0595	0.7799
ROE	-0.1967	-0.8342	0.7965
EXTRA COSTS/EXTRA EARNINGS (%)	-0.6007	0.6759	0.8753
LONG TERM DEBTS	-0.1385	0.2623	0.8753
DEBT RATIO	0.6358	0.1071	0.9197
DEBT/EQUITY RATIO	0.1804	0.5710	-0,9636

It is worth remarking that a first outcome of this research is a set of ESG indicators that (more than others) are related to the management of operational risks of the firms. Such indicators arise from an engagement process that involved all stakeholders, e.g. policy makers, authorities, regulators, enterprises (SMEs, NMEs and listed firms), banks, financial and insurance corporations, private equity funds as well as entrepreneurs and scholars.

5.5.2 Analysis of the linear regression results

As regards small enterprises (identified according to the European definition), increasing the branches leads to an increase in the responsible business actions implemented by the firm. In this case, the relocated activities of small enterprises are mostly branches and depository/warehouse facilities for either semi-manufactured transfers or a subset of the manufacturing phases. Such enterprises devote attention to monitoring their environmental impacts, by means of their CO₂

emissions and are characterised by a rather large number of employees as pointed out by a moderate correlation between CSR indicator and the personnel variable (see Table 18). This is in accordance with organisation science as companies growing in the number of employees adopt a structured organisational process with procedures, protocols, standardisation and trained staff. Furthermore, it is worth noting CSR actions are mostly implemented by small and young enterprises and start-ups (see variable AGE in Table 18). This suggests that the new generations of entrepreneurs and employees have a greater sensitivity to environmental, social and governance (ESG) issues.

As concerns the correlation between CSR and economic performances, the debt ratio increases with the CSR actions, pointing out that small enterprises monitoring their impacts have a larger ability to borrow and to maintain a creditworthiness in the long run. However, such results do not translate into better economic performance as for small enterprises there are no correlations between CSR and the fundamental indices related to the return on investment or equity. Moreover, there is a moderate correlation between CSR and part-time employees, suggesting that small enterprises can stabilise and improve the contractual conditions of employees (who are fundamental stakeholders) to the detriment of their profits. From a risk management perspective, such enterprises mitigate the risk of losing strategic stakeholders in spite of their short-run profit as, in the long term, this action could translate into continuous cash flow.

As concerns medium enterprises, Table 18 shows a positively correlated CSR indicator to the return on investment. It is worth remarking that a ROI positively related to responsible business conduct increases the confidence of bankers as it indicates firms committed to their “core business” management, thus increasing the probability of return of cash flow and decreasing the probability of stakeholders’ withdrawing. In this regard, it is worth remembering that financial institutions, such as Generali SGR, Intesa Sanpaolo, UNEP, Caisse des Depots, regularly evaluate the ESG related to their core business, so as to continuously monitor the business riskiness and the proper application of adequate safeguard measures. Conversely, CSR increases with a decrease of ROE and an increase of debt/equity ratio. These point out that medium enterprises aim to borrow capital but (rather than small ones) need to set aside profits and assets to fund themselves for their investment plans.

In the case of medium enterprises, Table 18 points out a strong positive correlation between CSR and the number of employees as well as with adoption of a code of ethics. In the risk management perspective, these suggest that the most sustainable enterprises have structured their business organisation, with a division of tasks along the value chain with core and support activities monitored by qualified owners that lead to a reduction of the overlap between tasks and of riskiness. Indeed, business processes are continuously monitored, thus avoiding a centralisation of functions and keeping a segregation of duties, which is the main rule for evaluating organisational riskiness. Furthermore, the most CSR compliant enterprises formalise their code of ethics which represents a fundamental safeguard within their organisational and management models. A continuous risk

assessment conforms such firms to the OECD legal standard concerning anticorruption and social and environmental risk mitigation so as to lead to ESG models exempted from responsibility risk. In Italy these standards have been adopted by Legislative Decree no. 231/01, whereas Germany, France, Portugal, the United Kingdom and USA adopt equivalent regulations in order to introduce ethical safeguards and CSR to decrease operational risks. Moreover, medium enterprises devoted to socially responsible management make a large use of part-time employees suggesting that they have particular focus on reconciliation of the work-life balance. Again, in terms of risk management it is fundamental to monitor business welfare and well-being of the employees in order to dissuade strategic employees who could commute to competitors.

Finally, there is a high negative correlation between CSR and branches of medium enterprises (see Table 18). This points out that, unlike small and large enterprises, the medium ones do not manage the delocalisation processes in an ethical way probably being less focused on and committed to the local community. In terms of risk management, this might suggest to bankers the necessity of specific assessment of medium enterprises with several branches, in particular for delocalisation processes related to high risk of pollution.

As regards large enterprises, Table 18 shows a robust positive correlation between CSR and export. This points out a propensity to globalisation of the large enterprises that become devoted to the evaluation and management of ESG processes with all partners along the supply chains so as to gain a competitive advantage with respect to worldwide competitors. This conclusion is further supported by the positive correlations between CSR and number of branches, number of employees using part-time, adoption of a code of ethics and risk assessment for prevention of organisational and administrative risks. Indeed, the large enterprises devoted to CSR have safe management of transfers between branches, measure of protection for the employees, structured organisational processes related to operational risk assessment and code of ethics within the operational management of the supply chain.

We can observe that in the case of large enterprises that are “CSR oriented”, all financial performance indicators (ROA, ROI, ROS and ROE) are positively related to the ESG management. The same remark is valid also for EBITDA, even though with a smaller correlation coefficient.

Moreover, another issue of considerable interest is the correlation between CSR and core business. It is interesting to recall the British Petroleum case: its social accounting was apparently perfect, but the company caused an environmental disaster, neglecting the safety monitoring of the undersea pipelines and the adoption of health and safety standards.

The case of British Petroleum points out that regarding risk assessment, it is fundamental that ethical criteria should refer to (and be implemented by) “the core business” rather than to philanthropic (merely compensative) initiatives.

Finally, as regards financial accounting, large enterprises that are “CSR oriented” tend to increase their long-term-debt and “debt ratio”, thus pointing out their creditworthiness and credibility in the credit market for R&D, innovation

and expansion strategies. This is further confirmed by the robust negative correlation between CSR and debt/equity ratio that denotes large enterprises with adequate financial structure and equity.

Chapter 6

Conclusions and perspectives

This thesis, framed in the wide topic of relationship between Corporate Social Responsibility (CSR) and corporate performance, ~~and~~ aims to contribute to the understanding of such relationship through the analysis of literature review and by means of an empirical analysis applied to manufacturing sector. The former allows identifying some critical methodological issues for which it is assumed potential paths of improvement. Among these econometric models are adopted. The work investigates deeply the link between stakeholder-related CSR domains and, on the one hand, product and process innovations; on the other hand, ESG indicators that (more than others) are related to the management of operational risks of the firms.

Starting from the illustration of the evolution of the concept of CSR, the research outlines theoretical framework forming the basis for the social responsibility. Further it highlights the importance of stakeholder theory into perspective as interpretative framework for tie between CSR and corporate performances in terms of product and process innovations and financial resources. The context analysis leads to define the hypotheses, developed and tested by means of econometric models.

In order to test the first hypothesis, a hierarchical cluster analysis is carried out, for partitioning the firms in relation to stakeholder groups to which CSR initiatives are primarily directed. Then, the clusters are used for developing a bivariate probit model, which takes into account the tie between CSR clusters and technological innovation (product and/or process).

The objective is to investigate whether efforts in stakeholder-related CSR practices have an impact on innovation performance. More specifically the purpose is to study if firms with a greater breadth of stakeholder-related CSR domains covered have a greater probability of achieving product and process innovations.

Previous works already examined how specific stakeholder-related CSR activities entail different types of benefits, including innovation (Perrini and

Tencati 2006)⁽¹⁶⁰⁾. However, most studies focused on a single or few stakeholders related activities.

In line with stakeholder theory (Freeman, 1984; Clarkson 1995; Freeman 2017; Perrini, 2018)⁽⁶⁹⁾⁽⁴³⁾⁽⁷⁷⁾⁽¹⁶³⁾, I assume that the company has to accept and manage all requests coming from the various stakeholders, and in general from all actors that interact with it. This is why all subjects, falling into the relationships sphere of company and expressing an articulated set of needs towards it, are able to influence its performance and contribute to value creation. Further if the company respond positively to the requests of internal and external stakeholders may acquire a competitive advantage that, in turn, generate fundamental assets for the firm also in terms of innovations (Barney 1991; Russo and Fouts 1997; Mendibil et al., 2007; Ferauge, 2012)⁽¹¹⁾⁽¹⁷⁶⁾⁽¹³⁵⁾⁽¹⁵⁸⁾.

On the basis of theoretical and empirical studies examined, I point out firms assuming a broad and inclusive approach towards stakeholder-related CSR domains have more probability to innovate in terms of products and processes. In the terms expressed by Brower & Mahajan (2013)⁽²³⁾, it can be said firms that decide to concentrate many CSR efforts on one specific domain, choosing a "going vertical" strategy have less probability to innovate in products and processes. Conversely firms that allocate their CSR efforts to many domains, adopting a "going lateral" strategy, gain more probability to realize innovations.

Findings suggest that firms that embrace a broad range of their stakeholder-related CSR domains, that is proceed according to "a going lateral" behaviour, respond with a stronger propensity to make new products and to adopt new processes. Therefore the first hypothesis, that firms with a broad involved commitment in CSR initiatives have a greater probability of product and process innovations, is confirmed.

For verifying the second hypothesis, thus investigating the effect that each variable has on the joint probability to innovate, a bivariate probit model is developed. The model connects the product and process innovations to multiple explanatory variables, i.e. all variables stakeholder-related CSR, and it serves to support the assumption, derived from the context analysis, that the highest contribution to combined product and process innovations is provided by domains such as Work Environment and Employee, and Natural Environment and Local Community. The marginal effects computed show that the explanatory variable, which prevails over the others, is the Employee domain. In fact, when a firm adopts initiatives in that field, the probability of a firm to realize joint innovations in product and process increases significantly. Yet the gain is lower ~~more low~~ rather than that reached adopting a broad range of stakeholder-related CSR. Therefore the second hypothesis is partially confirmed, but the result corroborates the first assumption.

These results offer several implications for further research and practice.

For what concerns research implications, the results obtained offer further empirical confirmation of the assumptions about the link between CSR practices and innovation, although they address this link more precisely using a bivariate probit model that is employed in empirical works for determining the influence of

a set of variables on the innovation strategies, thus handling with the firm behaviours (Boquet et al., 2013)⁽¹⁶⁾.

A limited number of works approach the study of relationship from a broader stakeholder perspective. To the best of our knowledge, this thesis represents one of the few empirical analyses on the connections existing between socially responsible initiatives and innovative performance from the perspective of stakeholder theory, as witnessed from previous research that addresses strategies for guiding an extended range of stakeholder requests (Parmar et al. 2010)⁽¹⁵²⁾. Therefore, the major contribution of the thesis is on the corporate management applying to the analyses a stakeholder approach with the aim to prove that broad CSR might improve innovation performance. Our findings confirm empirically that stakeholder framework represents the right approach to address the issue and define better and make operational the concepts of CSR.

As regards practical contributions, for CSR and innovation managers, this means that to foster product and process innovations, firms should implement CSR practices in all CSR areas, without neglecting any stakeholder. Indeed, what emerges from our research is that recognizing the needs of all stakeholders can potentially enhance future innovation opportunities. Actually, beyond the specific stakeholder towards whom the efforts are devoted, taking into consideration the needs of all the stakeholders seems a necessity in order to enhance the innovation capacity. However the emphasis is on the breadth of the actions rather than on specific initiatives attributable to a particular stakeholder group, thus proving that the relevance is on a holistic, comprehensive, inclusive and integrative perspective. Additionally, in an ideal situation, the firm should anticipate and meet the stakeholder needs in order to avoid hostile posture and match its strategies with possible stakeholder's behaviour (Perrini, 2018)⁽¹⁶³⁾.

Regarding the relationship between CSR and financial performance, this research thesis investigates the tie, not yet deeply studied in the literature, between Corporate Social Responsibility (CSR) indicators, risk management and capability in order to increase trustworthiness within the credit rating processes.

Due to the inter-linkage between CSR, finance and risk, the assessment that banks carry out to calculate the probability of default – based on Basel standards – includes aspects that are specifically monitored through some CSR or ESG indicators, linked to environmental, social or security risks. Indeed, it is possible to use specific CSR indicators as an acknowledgement of the companies' capabilities to create value and have a low risk of default. Consequently, sustainable companies are more likely to obtain:

- an interest rate on loans/financings which is lower than the market rate, and which is rewarding in comparison to what other non-CSR companies and customers are able to obtain;
- lower spread;
- lower fees on services;

- a longer time period to repay financing in comparison to the usual time fixed by the bank, having in this way a longer lapse of time to repay disbursed funds.

Therefore, the use of qualitative, relational, intangible-related and environmental indicators linked to the risk assessment of companies, also improves the application of the Basel rating formula.

The empirical analysis presented in this work shows that for small enterprises there are significant positive correlations between ESG and debt ratio, number of branches and employees; for medium enterprises there is a robust positive correlation between ESG and ROI as well as code of ethics, risk assessment and better company structure. Finally, large enterprises that are ESG-committed show better economic and financial performances according to ROA, ROI, ROS, ROE indicators, long-term debt and debt ratio.

In conclusion, by exploiting the positive inter-linkage between CSR and finance and risk, the work develops a methodology to support banks in the calculation of default probability - based on Basel Standards – including fields monitored through CSR or ESG indicators. This approach allows understanding of companies' capabilities to create value and demonstrate low risk of claims, fines and default.

As all research studies, also this study is not without limitations.

A primary one relates to the specific characteristics of the sample including medium sized firms of manufacturing industry. Another limitation regards the dimension of the sample and the specificity of the context (from a geographical and sectorial point of view). Future research should consider firms of varying size and different sectors in order to control the impact of these variables on the relationship investigated.

Future research could also consider other types of innovation such as organizational, marketing and business models innovations.

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Appendices

Agent-based modelling and simulation for energy markets and for the management of port

This appendix aims to summarize the PhD activities on topics close to the main focus of the Ph.D. thesis.

The first contribution “Comparing investments in transmission network and renewable power plant relocations in the Italian energy market” analyzes the Italian Power Exchange (IPEX) and proposes a framework for evaluating the effects of policy mechanisms. In particular, a comparison between investments in transmission networks and generation capacity relocation policy under a zonal pricing mechanism is discussed.

The aim is to understand if the existing Italian power mix allows possible solutions that increase consumers’ social welfare, by taking advantage of the existing constraints in the transmission network and the zonal pricing mechanism. It is worth remarking that comparing relocation policy with investment in transmission capacity is strongly counterintuitive as classical literature considers investments in transmission infrastructure the only viable path to an efficient electricity market. Thus, the purpose of this work is to provide an innovative framework for discussing and proposing policy design mechanisms that are able to alleviate high zonal-prices and that can better integrate renewable generation. Results points out that a proper localization of a reduced set of power plants is able to increase consumers’ social welfare by taking advantage of the zonal splitting mechanism and its trans-mission capacity constraints even with respect to classical efficient solution based on eliminating every energy transmission constraints.

The second part “Agent-based model and simulations of the management of ports: the import processes at the port of Genoa” deals with the modelling and implementation of the import process of goods in a port in order to make more organized, fast and efficient complex logistics network, through ad-hoc development policies. To this purpose, we develop an agent-based model (ABM) of a port, populated by the real main actors (stakeholders) involved in the port activities. The model simulates the actual port processes, i.e., the sending of goods, the acceptance or not of imported goods, the planning of transports etc. With this framework, the business process is implemented for developing a computer supported management tool to handle the port activities flow. The tool is designed for the integration in a virtual infrastructure that allows an advanced operational management of port traffics. By modelling the time documentation according to the specification of the Genoa case, the business case of the port of Genoa is tested. Results show that the mechanism implemented simulates the

actual process. Moreover some bottleneck are discovered, such as delays to the handling of the containers and queues formation due to missing documentation or documentation with errors or not ready.

Appendix A

Comparing investments in transmission network and renewable power plant relocations in the Italian energy market

Introduction

The most investigated topics in the electricity market sector refer to the methodologies able to address towards an efficient electricity market.

Classical economic theory suggests that investments in infrastructure represent the optimal viable path for matching the goal. Generally speaking, suppressing any friction to the free flowing of goods (i.e. transmission network constraint in the electricity market) is the efficient solution to reducing prices and thus to increase consumers' social welfare.

This approach has strongly influenced our society and economy and is driving the idea of a pan European electricity market comprised by a single area with a uniform price from Norway to Greece without transmission constraints. However, this approach does not consider the complexity of the system under investigation and the opportunity offered by the power mix and its possible relocation within a specific zonal-splitting market clearing mechanism.

Before the transition toward a liberalized electricity sector, Hogan pointed out that locational price differences defined the opportunity cost of transmission and that the potential to arbitrage these same price differences was able to provide a market incentive for transmission investments [4]. Moreover, Joskow argued that economic and reliability- based criteria for transmission investment were fundamentally interdependent and ignoring these interdependencies might had adverse effects on the efficiency of investment in transmission infrastructure and would have undermined the success of electricity market liberalization [5].

While deregulated electricity markets were initializing their operations, many practitioners started studying approaches to increment transmission investments so to reduce the exertion of market power and to give other economic signals to the different actors. During the following years, as deregulated markets were established, empirical market data were collected and some positive outcomes were accepted by the scientific community, the topic of transmission investments witnessed a new increase in importance and several approaches have been proposed. Game theory, computational economics, artificial intelligence as well as electrical engineering methodologies were used to design innovative solutions. In [9], Siddiqui used a real options approach to determine both the optimal investment timing and line capacity under uncertain congestion rents. Leou et al proposed a method combining Monte Carlo simulations and the greedy algorithms to find optimal transmission expansion plans [7]. Skoteinos et al proposed a methodology to assess the economic evaluation of alternative transmission expansion plans, based on measures of market performance using IEEE 24-bus

reliability test systems so to determine cost-benefit scenarios and to test their performances [10].

During the last two decades, generation capacity investments have been discussed in parallel with transmission network investments. As described by Ventosa et al, the most commonly used modelling techniques follow three main trends: optimisation models, dynamic simulation models and equilibrium models [13]. Within the first context, Schroeder et al, presented equilibrium models which incorporated long-term uncertainty and multi-stage decision-making and accounting for the real option character of investments, so to quantify how fuel and carbon price risk impacts investment incentives of thermal power plants [10]. Moreover, Burger et al studied game theoretic models for generation capacity investment decisions in deregulated electricity markets, by means of S-adapted Cournot equilibrium in the German electricity market [2]. Within the context of dynamic simulation models, Joskow, argued that market imperfections and institutional constraints might have the effect of keeping wholesale prices for energy and operating reserves below their efficient levels during hours when prices should be very high and possibly lead to underinvestment in generating capacity [6]. At the junction between dynamic and equilibrium models, Botterud et al studied how uncertainty influences the optimal timing of investments in new power generation capacity, implementing a stochastic dynamic optimisation model to solve the problem for a decentralised and profit-maximising investor in the electricity market [1].

More recently, a huge number of renewable power plants have been installed worldwide and understanding their impact on level of prices has become a crucial problem. In [11], Smith et al examined the design and operation of a cross-section of electricity markets in the US giving insights into the needs of markets necessary to accommodate significantly higher levels of variable renewable energy in the future. Boerema et al studied how key characteristics of the underlying wind and solar resources may impact on their energy value within the Australian National Electricity Market [14]. Their analysis showed that these energy resources within NEM have key characteristics that could markedly impact on their energy value within the wholesale electricity market.

Irrespective to large attention and efforts of the scientific community, the debate on the localization of renewable energy sources is still open, thus offering opportunities for non-conventional approaches.

In these respects, this work analyses the Italian Power Exchange (IPEX) and proposes a framework for evaluating the effects of policy mechanisms. In particular, a comparison between investments in transmission networks and generation capacity relocation policy under a zonal pricing mechanism is discussed. The aim is to understand if the existing Italian power mix allows possible solutions that increase consumers' social welfare, by taking advantage of the existing constraints in the transmission network and the zonal pricing mechanism. It is worth remarking that comparing relocation policy with investment in transmission capacity is strongly counterintuitive as classical literature considers investments in transmission infrastructure the only viable path

to an efficient electricity market. Thus, the purpose of this work is to provide an innovative framework for discussing and proposing policy design mechanisms that are able to alleviate high zonal-prices and that can better integrate renewable generation.

Results points out that a proper localization of a reduced set of power plants is able to increase consumers' social welfare by taking advantage of the zonal splitting mechanism and its transmission capacity constraints even with respect to classical efficient solution based on eliminating every energy transmission constraints.

Firstly, an empirical analysis on Day Ahead Market prices is performed so to evaluate such opportunities in the case of the Italian electricity market. In this context, investments in transmission capacity have been evaluated, using a computational framework that solves the market and replicates the Italian Day Ahead Market, as well as the presence of over and under generation capacities in the different areas. This led to the opportunity to evaluate possible scenarios of generation relocation, in particular for renewable power plants. The different solutions arising from investments in transmission capacity and from power plants relocation have been compared by means of the Daily Average PUN, i.e., the consumers' social welfare proxy defined as the average unit cost paid daily by consumers.

The paper is organized as follows: a description of the Italian electricity sector; with attention to Day Ahead Market. Then the analysis on investments in transmission network and power plant relocations are presented. The comparison between the policies and the conclusions are reported at the end of the paper.

The Italian Electricity Market

The Italian Electricity Market, called Italian Power Exchange (hereafter IPEX), arises from Legislative Decree no. 79 of 16 March 1999 (Legislative Decree 79/99), which accepted the European Directive on the internal market in electricity (96/92/EC) into the national legislation.

The Italian wholesale market started to operate as a Pool in April 2004 and became an Exchange in 2005 with the liberalization of the demand side bidding.

The presence of new independent power producers against the old (ex) monopolist, introduced a problem of coordination between time varying demand and supply of electricity. Indeed the new liberalized market structure requires a central mechanism so to continuously match demand and supply.

The AEEGSI (Electricity, Gas and Water System Regulator) is the independent Regulator established by Law no. 481 of 14 November 1995 with the task of guaranteeing the promotion of competition and efficiency in the electricity & gas sectors. AEEGSI is responsible, among others, for defining rules for Merit-Order Dispatch and market power control mechanisms.

Since January 1st 2005, the market has been opened to full demand-side participation: all interested operators may trade the electricity that they need directly on the power exchange, under the obligation of hourly scheduling their

withdrawal and injection profiles. The supply chain and the actors involved in the functioning of the Electricity Market are shown in Figure 12 (the picture is taken from [15]). In particular, the main entities which contribute to the operation of the power system are:

- “Gestore dei Servizi Energetici” (GSE), is a publicly-owned company (“società per azioni”) playing a central role in promotion, support and development of renewable sources in Italy. GSE’s sole shareholder is the Ministry of Economy and Finance, which exercises its shareholder rights together with the Ministry of Economic Development. GSE controls three subsidiaries: AU (Acquirente Unico); GME (Gestore dei Mercati Energetici); and Ricerca sul Sistema Energetico (RSE). GSE buys the electricity generated by CIP-6 power plants and sells it in the market;
- “Gestore dei Mercati Energetici” (GME), is a company (“società per azioni”) established by GSE. GME is vested with the economic management of the Electricity Market under principles of transparency and objectivity, with a view to promoting competition between producers and ensuring the availability of an adequate level of Reserve Capacity. In particular, GME manages the Day-Ahead Market (MGP), the Intra-Day Market (MI), the Ancillary Services Market (MSD) and the Forward Electricity Market (MTE);
- Terna S.p.A., is a company in charge of electricity Transmission and dispatching over the high-voltage (HV) and extra-high voltage (EHV) grid throughout Italy. Terna balances supply and demand of electricity for 365 days a year and 24 hours a day;
- “Autorità per l’Elettricità e l’Energia” (AEEG), guarantees the promotion of competition and efficiency in the sector and has regulation and monitoring tasks.

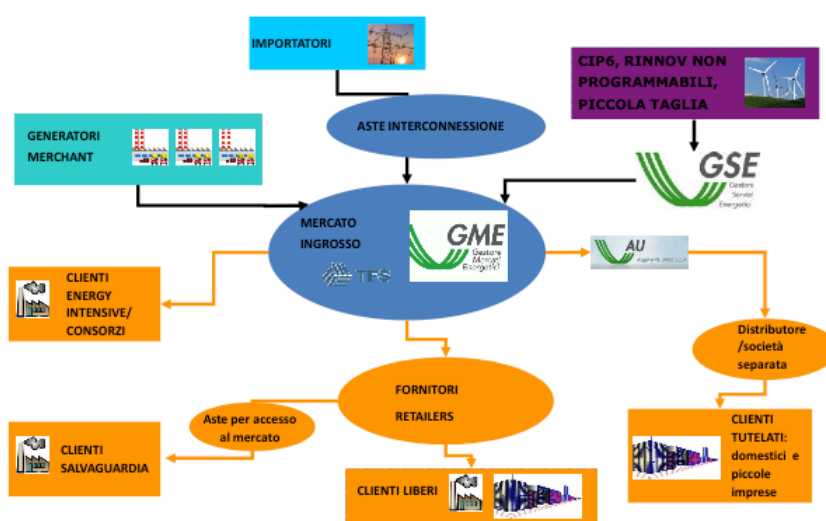


Figure 12: Supply chain of the Electricity in Italy.

GME organizes and manages the Energy Markets, which consist of the Spot Electricity Market (MPE), of the Platform for physical delivery of financial contracts concluded on IDEX (CDE) and of the Forward Electricity Market (MTE) (Figure 13, the picture is taken from [16]). Therefore, GME does not organize merely financial markets but real physical markets, where physical injection and withdrawal commitments are scheduled.

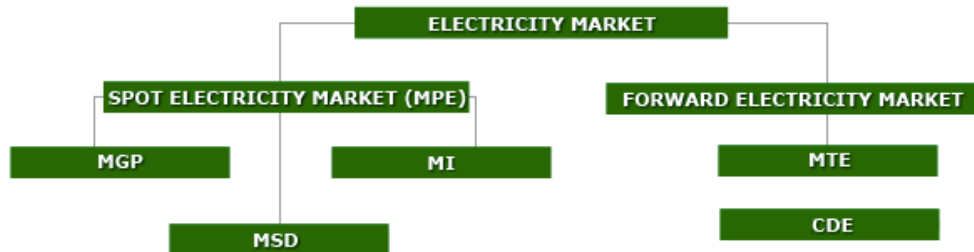


Figure 13: Organizational structure of the Electricity Market in Italy.

One of the peculiar aspects of the Italian electricity market - and more in general of the Italian power system - is the presence of market zones. The zones play a crucial role in the splitting of the market in case of congestions and lead to a zonal pricing algorithm for clearing the market.

It is worth remarking that the main difference between the Italian electricity market and the other European markets consists of the economic mechanism for allocating transmission capacity. Indeed, instead of settling the transport capacity for each participant to the market before the starting of the day-ahead market session with an explicit auction, the Italian mechanism adopts an implicit transmission capacity auction, i.e. the hourly transport capacity and the related fees are implicitly calculated by the market resolution algorithm.

For the sake of power system security, the Italian power system consists of portions of transmission grids linked by connections characterized by physical limits to transmission of electricity. The zones of the critical grid may correspond to physical geographical areas, virtual areas (i.e. without a direct physical correspondence) or to constrained zones, (i.e. virtual zones whose generation is subject to constraints in terms of management of the power system due to security conditions).

The transmission grid is directly considered by the Italian day-ahead market mechanism, and GME uses the simplified map of the grid shown in Figure 14 (the picture is taken from [17]) with a DC optimal power-flow optimizer, (i.e. a representation that comprehends the most significant transmission limits in the transmission grid linking the zones), in order to determine the locational marginal price.

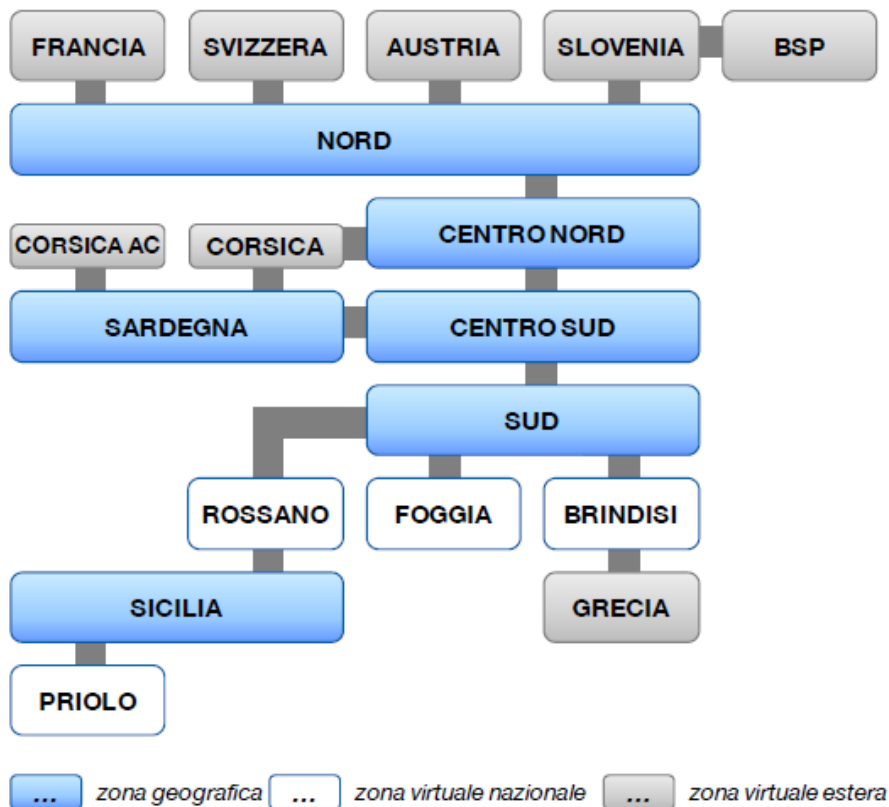


Figure 14: Zonal representation of the Italian Power System Network.

The Italian Day-Ahead Market and the Italian power mix

The Day-Ahead Market (MGP) hosts most of the electricity sale and purchase transactions. The MGP is a wholesale electricity market in which hourly energy blocks are traded for the next day.

Participants submit offers/bids where they specify the quantity and the minimum/maximum price at which they are willing to sell/purchase. Price/quantity are aggregated by the market operator in order to determine the hourly supply and demand curves.

Participants submit price/quantity offers for each hour separately to the MGP which are aggregated by the market operator in order to determine the hourly supply and demand curves. Producers and consumers can engage bilateral contracts for short and long term exchange of electricity. The quantity traded bilaterally must be included in the total demand and supply recorded in the exchange as price-taker offers, as they contribute to the implicit transmission capacity auction.

The MGP is an auction market and not a continuous-trading market so bids/offers are accepted after the closure of the market sitting based on the economic merit-order criterion and taking into account transmission capacity limits between zones.

The zones in the Italian market correspond to virtual zones representative of foreign neighbouring markets (Austria, Corsica, France, Greece, Slovenia, and

Switzerland), limited production poles (Brindisi, Foggia, Monfalcone, Priolo, Gargano and Rossano) and also physical national zones (Northern Italy, Central Northern Italy, Central-Southern Italy, Southern Italy, Sardinia and Sicily).

All the supply offers and the demand bids belonging to foreign virtual zones that are accepted in the MGP are valued at the marginal clearing price of the zone to which they belong. This price is calculated, for each hour, reaching the intersection of the demand and supply curves and is changed from zone to zone when transmission capacity limits are saturated.

The accepted demand bids regarding the consuming units belonging to Italian geographical zones are valued at the “Prezzo Unico Nazionale” (PUN – national single price); this price is equal to the average of the prices of geographical zones, weighted for the quantities purchased in these zones.

Such price for hour h is given by:

$$PUN_h = \frac{\sum_{z=1}^N LMP_{z,h} \cdot D_{z,h}}{\sum_{z=1}^N D_{z,h}}$$

where $z = 1, \dots, N$ denote zone z in the Italian market, $LMP_{z,h}$ is the Locational Marginal Price of the zone z at hour h and $D_{z,h}$ is the total demand accepted in zone z at hour h . Whereas the aggregate accepted demand Q_h at hour h is given by:

$$Q_h = \sum_{z=1}^N D_{z,h}$$

It is worth noting that the quantities in Eqs 1 and 2 include also the energy traded through bilateral contracts and the power imports from foreign countries.

The difference between the zonal prices paid to producers and the PUN paid by consumers' offers a complex economic system. The presence of a differentiated zonal price points out a correct localization of power plants. Producers would have an incentive to build production facilities in areas with a less efficient generation and a limited ability to interconnect with the national transportation network. The purchase price, on the contrary, is unique on the whole national territory even if there are congestions. Therefore, the presence of a single national price (PUN) should not penalize areas of the country characterized by a less efficient generation set.

Energy efficiency policies imposed by governmental agencies are appropriate means to improve the efficiencies that the market alone cannot assure [3]. For example, demand response and energy efficiency can help improve electric-system operations by reducing the demand peak and driving peak prices to a lower level [8].

In 2007, European Council adopted ambitious energy and climate change objectives for 2020. They have been accepted in Italy and in most European Countries, for reducing the general level of prices especially during peak-hours and the congestions and also for integrating and promoting large scale

investments in renewable generation and decommissioning old and highly-cost power plants.

A major drawback of these pan-European actions is that there is yet no evidence whether the new power plants have been placed in a strategic way. Moreover, investments in generation should be carried out with a careful and looking out to the transmission network infrastructure, due to the scarcity of the transmission capacity as discussed above.

Indeed, having a coal-based energy mix has many impacts on the electricity prices and the social environment. Conversely, the more renewable sources, participating to the market, are giving lower energy prices, typically offering their energy with a quasi-null price and assuming a constant and quasi-inelastic demand curve. Moreover, these social and economical outcomes can be obtained addressing consumers to match their behaviours to dynamic prices and to shift their peak usages of electricity when it is more convenient, i.e. late day hours and night. Many countries have adopted guidelines to promote a more efficient use of electricity, especially with the growing penetration level of renewable energy in the market.

It is worth noting that the stochastic nature of this type of resource requires increased deployment of operating reserves to balance the system and demand response can play an important role in reducing overall system costs, especially if a price responsive demand mechanism is developed and customers can change their behaviour. In this context, Italy's energy mix has been characterized by a strong dependence on fossil fuels, which has always satisfied the demand for electricity for more than its 70% [12].

In order to exploit the growing penetration level of renewable sources in the Italian electricity market, some infrastructure changes result to be necessary either to the transmission network or to the market mechanisms so to provide also security of dispatching and network's aggregate security.

Therefore, with an increased share of energy in the market bid at a null price, owners of high-cost power plants gradually decreased their intervention in the market because their bids were rejected. Moreover they had to start reprogramming their production in the subsequent markets so to be able to sell their electricity. Furthermore, the new share of non-dispatchable renewable sources in the day-ahead market increased the need for more ancillary services to guarantee security of the transmission system, when renewable power plants were not producing electricity.

One of the aims of having a high share of RES in the energy mix is to decrease the average prices on the wholesale market and to reduce peak prices, which in the case of Italy are among the highest in Europe. This might also lead to a decrease in the burden paid by consumers, if the effect on consumers' prices was a direct reflex of this mechanism. However, actually the electricity bill is affected by the high cost of fossil fuels and it is composed by some tariffs which are not going to decrease, even with a greener energy mix.

The combination of network congestions and zonal prices equal to zero evidences the need for policies that improve the use and especially the flow of

energy produced by renewable sources in the zones with higher prices. To solve these issues only two approaches are possible:

- Incrementing the network transmission capacity of the lines more subject to congestions.
- Performing a zonal reconfiguration of a subset of renewable power plants studying the position of power plants, the zonal prices and the congestions.

As said above, classical economic theory suggests that investments in infrastructure represent the viable path toward an efficient market. This approach has strongly influenced our society and economy and is driving the idea of a pan European electricity market comprised by a single area with a uniform price from Norway to Greece without transmission constraints. However, this approach does not consider the complexity of the system under investigation and the opportunity offered by the power mix. Indeed, such frictions might result in unexpected either weakness or strength of the possible scenarios that might lead to unconventional and counterintuitive solutions, as discussed in the following sections.

Comparison between different scenarios arising from investments in transmission infrastructures and power plants relocation

Starting from the public data published by GME and from our computational framework that simulates the Italian MGP mechanism, two different market scenarios have been considered in order to calculate LMPs and PUN prices.

In the first scenario, by keeping the transmission limits adopted by GME and the real bids and offers, the locational marginal price LMPs and PUN prices (i.e., PUN_{con}) have been calculated under constrained inter-zonal capacity. On the other hand, in the second scenario the same real bids and offers have been considered removing the transmission limits among zones, thus causing to a hourly unique market clearing prices (i.e., PUN_{uncon}). It is worth remarking that these two scenarios differ just in the inter-zonal transmission capacity whereas all other elements have been kept unchanged. This condition is important as it allows determining both required investment in transmission infrastructures and effects of such investments on the market results.

The Figure 15 shows the results of the first scenario reporting LMPs and PUN_{con} prices during the 24 hours. The outcomes, obtained simulating the first scenario, show that three Macro Zones can be identified (i.e., aggregation of zone characterized by the absence of a market splitting due to energy flows in transmission interconnections within the capacity limits):

1. SICI and PRGP (Macro Zone 1, hereafter MZ1);
2. SUD, ROSN, FOGN and BRNN (Macro Zone N°2, hereafter MZ2);
3. NORD, CNOR, SARD and CSUD (Macro Zone N°3, hereafter MZ3).

The results point out the presence of network congestions during some hours. In particular, a first congestion arises in the transmission connection between

MZ3 and MZ1, whereas the second network congestion has been observed in the transmission connection between MZ1 and MZ2.

The congestion between MZ1 and MZ2 is always present, apart from hours 2, 3 and 4, in which the market is characterized by the absence of network congestions (i.e., all LMPs are identical and equal to the PUN_{CON}).

During the peak-hours also the congestion between MZ3 and MZ1 is present thus leading to an Italian power market divided into three price-areas.

Furthermore, MZ1 is characterized by the highest locational zonal prices during the 24 hours, whereas during the central hours of the day MZ2 recorded prices equal to zero. Therefore we can conclude that MZ1 and MZ2 are surely under and over-sized, respectively. Furthermore, the presence of market zonal splitting among MZ2 and both MZ1 and MZ3 candidates for possible investments in transmission infrastructures the connections between MZ2 and MZ1 and between MZ2 and MZ3.

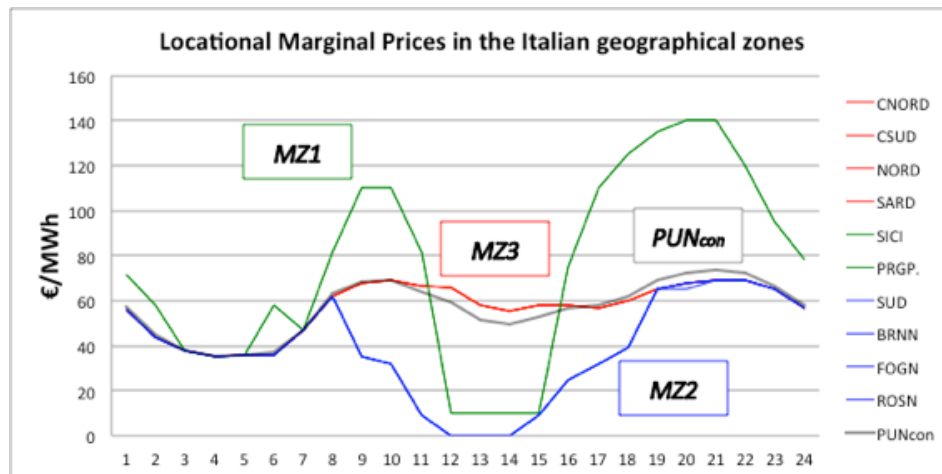


Figure 15: Locational marginal prices (in €/MWh) in the Italian geographical zones during May 3rd 2012.

In order to understand the needed amount of investments in transmission network, hourly power flows on the transmission connections in unconstrained limit conditions have been computed and compared to the nominal capacity of transmission connections. The results show that only the connection between SUD and CSUD is characterized by lack of capacity. In particular, Figure 16 shows the required extra transmission capacity with respect to the current real transmission limits during the 24 hours.

Therefore we can conclude that with an investment of 1,251MW in the transmission capacity between SUD and CSUD zones, all friction to energy flow are avoided. It is worth remarking that the market capacity in the line is 2,000 MW. Thus, such investment requires a 60% increment of the nominal network capacity.

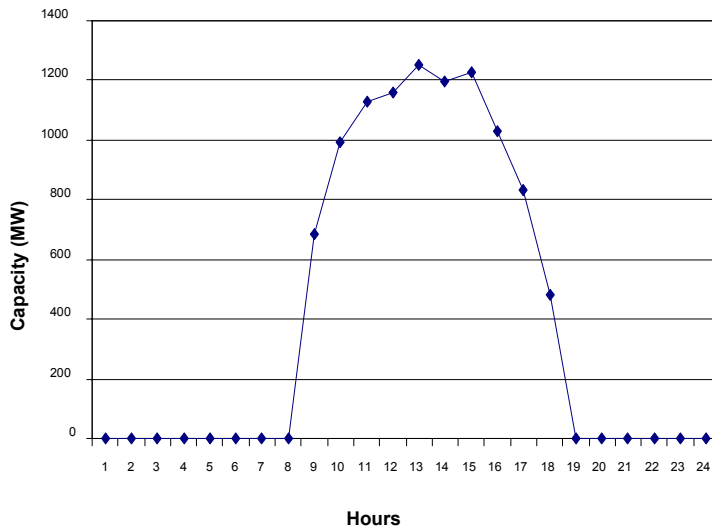


Figure 16: Extra-transmission capacity needed in the connection between SUD and CSUD.

In order to evaluate the effects of such investments it is useful to compare the aggregate market results in the constrained and unconstrained scenarios. Figures 6 and 7 show the PUN and the total aggregate accepted demand during the 24 hours.

Investments in transmission infrastructure lead to a reduction of zonal prices and of the PUN, which corroborates the idea that removing the frictions to the flow of energy is a good solution towards an efficient market. However, Figure 17 points out that there are some hours (i.e. 11, 12, 14 and 24) where the system is not behaving as expected. This evidence suggests that transmission limits can be a factor for improving consumers' social welfare. In particular, the presence of Italian zonal-pricing clearing mechanism and constraints in transmission grid produce an ecosystem that reduce the costs paid by consumers more than a free flow of energy context. Therefore alternative scenarios to investments in transmission infrastructure, such as power plants relocation, should be investigated and this topic will be discussed in the following of the paper.

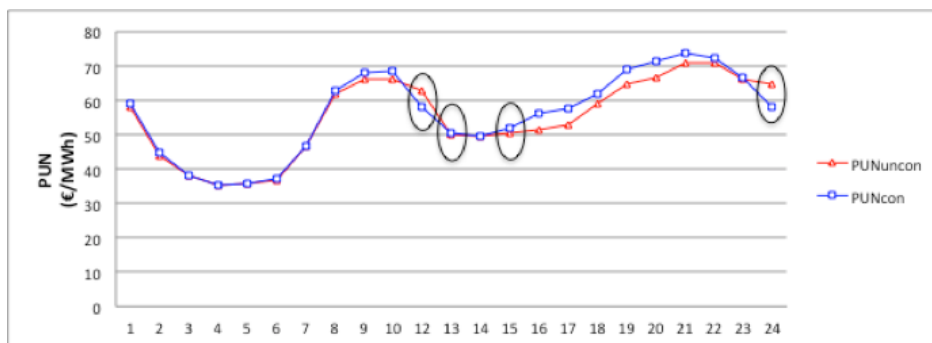


Figure 17: Hourly unconstrained and constrained PUN, national single price, (in €/MWh) during May 3rd 2012.

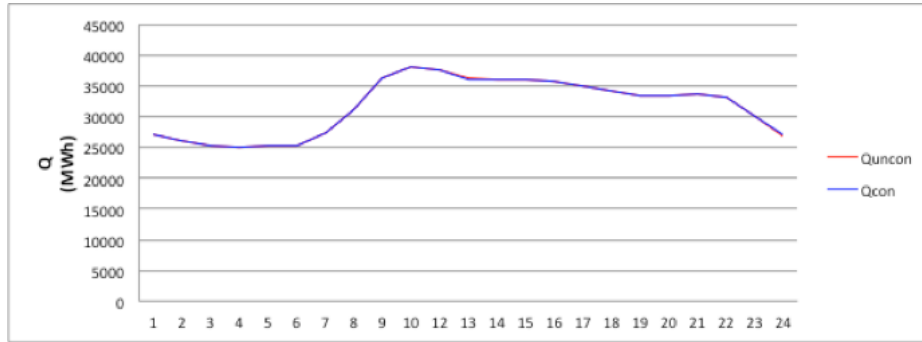


Figure 18: Hourly unconstrained and constrained Q, the aggregate accepted demand, (in MWh) during May 3rd 2012.

Power plants relocation policy is studied to evaluate if and how can reduce zonal prices and increasing consumers' social welfare. In order to carry out the analyses proposed we have to identify Macro Zones under and oversized, in terms of capacity, and to estimate the corresponding amounts then to study the possible reconfigurations of the potential power plants finally to calculate the impact of the new configuration.

In order to determine the different under- and over-generation capacity, we considered the constrained and unconstrained scenarios discussed above. In particular, in each Macro Zone z the over-generation capacity for each hour h is determined by considering the supply offers that have been discharged (i.e., not accepted by the market) with a submitted limit price less or equal to unconstrained PUN price at the same hour. The sum of such quantity corresponds to the zonal over-generation capacity.

Such analysis showed that only macro-zone MZ2 is affected by over-generation capacity. In the same way, in each Macro Zone z the under-generation capacity for each hour h is calculated by considering the demand bids that have been discharged (i.e., not accepted by the market) with a submitted limit price higher or equal to price unconstrained PUN price at the same hour. In this case, the sum of such quantity corresponds to the zonal under-generation capacity. This analysis pointed out that macro-zones MZ3 and MZ1 are characterized by under-generation capacity and in particular within macro-zone MZ3 it showed that zone NORD is characterized by under-generation capacity, whereas the other zones have limited requests of additional generation capacity.

Based on these results, we can conclude that the subset of power plants candidate for relocation belonged to the macro-zone MZ2. In particular, we selected 36 power plants from the share of renewable power plants in MZ2 and characterized by a offer price equal to zero. The renewable power plants was considered both because they were responsible for the presence of zero LMPs in MZ2 in the constrained scenario discussed above and they are the newer power plants installed in Italy. Thus, the proposed relocation policy can also be a design policy for the installation of generation capacity.

Once selected the 36 power plants, different market scenarios have been considered in order to evaluate the policy impacts. In particular, if we consider that each power plants could in principle be relocated from macro-zone MZ2 to either MZ1 or MZ3, the total number of possible scenario is $236 \cong 1011$. We decided to evaluate a random sampling of selected 105 cases. For each scenario, the Italian market clearing algorithm has been used for evaluating the corresponding LMPs and PUN for the 24 hours under constrained conditions. It is worth remarking that for each of these scenarios the difference from the real GME solution is just on the location of the selected 36 power plants whereas all other elements (i.e., inter-zonal transmission capacity and all the other offers) have been kept unchanged.

In order to compare the different solutions, we define an economic indicator. To this aim, we consider the daily average unique national price PUN defined as:

$$\overline{PUN} = \frac{\sum_{h=1}^{24} PUN_h \cdot Q_h}{\sum_{h=1}^{24} Q_h}$$

where PUN_h and Q_h are given by Eqs. 1 and 2, respectively.

It is worth remarking that \overline{PUN} is a valid proxy of the consumers' social welfare as it describes the average price paid by the consumers during the 24 hour of a day and allows a direct comparison of the different scenarios. In order to proceed, we have firstly calculated the daily average unique national price for the constrained and unconstrained cases discussed in above. Results show that \overline{PUN}_{CON} and \overline{PUN}_{UNCON} are equal to 57.599 €/MWh and to 56.700 €/MWh, respectively.

Based on classical economics, these two values represent the possible range for an effective relocation policy as one should expect that such policy improves the consumers' social welfare with respect to current situation with transmission constraints (i.e., \overline{PUN}_{CON} is the upper boundary) but cannot over-perform the solution determined by the unconstrained scenario (i.e., \overline{PUN}_{UNCON} is the lower boundary).

Moreover the Italian energy market regulation shows a complex system in fact among the considered 105 scenarios, 100% and 57% over-performed the constrained (i.e., \overline{PUN}_{CON}) and unconstrained (i.e., \overline{PUN}_{UNCON}) cases, respectively.

The best result among the tested 105 scenarios gives back a daily average unique national price \overline{PUN} equal to 56.001 €/MWh. Even considering the limited opportunity offered by the system, is over-perform by 47% the free of flow solution calculated by the unconstrained scenario.

Thus, these results corroborate the hypothesis that relocating a reduced sub-set of power plants can improve the performance for the consumers' social welfare rather than myopically investing in transmission network infrastructures.

Conclusions

Zonal prices and network congestions arose in Italy since the establishment of the electricity market. The existing power mix and the network infrastructure policies adopted in order to decrease congestions and reduce the electricity prices did not succeed in solving the problem. This paper presented a comparison between investments in transmission networks and generation capacity relocation policy under a zonal pricing mechanism. The aim is to understand if a relocation of the existing Italian power mix are able to maximize consumers' social welfare by taking advantage of the existing constraints in the transmission network and of the zonal pricing mechanism.

The proposed policy is strongly counterintuitive as classical literature considers investments in transmission infrastructure the only viable path to an efficient electricity market. Thus, the purpose of this paper is to provide an innovative framework for discussing and proposing policy design mechanisms that are able to alleviate high zonal-prices and integrate more efficiently renewable generation. An empirical analysis on the results of the Italian Day Ahead Market prices together with computer determination of the solution of the scenarios in the Italian Day Ahead Market have been employed to address the study. In this context, investments in transmission capacity have been evaluated as well as the presence of over- and under-generation capacity in the different areas.

These allow us to determine the possible scenarios of generation relocation, in particular for renewable power plants. The different solutions arising from investments in transmission capacity and from power plants relocation have been compared by means of the daily average unique national price which is a valid proxy of the consumers' social welfare as it describes the average price paid by the consumers during the 24 hour of a day. Results have shown that a proper localization of a subset of power plants allows us to increase consumers' social welfare within a zonal splitting mechanism even with respect to classical efficient solution based on elimination of all possible friction to the flow of energy.

This innovative and counterintuitive result suggest that (i) investing in transmission network is firstly useful in order to eliminate congestions; (ii) eliminating congestions does not necessarily lead to increase consumers' social welfare; (iii) relocating existing power plants and taking advantage of the Italian market mechanism and its transmission capacity limits is an advisable policy in order to increase consumers' social welfare.

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Appendix B

Agent-based model and simulations of the management of ports: the import processes at the port of Genoa

Introduction

Business process modelling is usually conducted by business process analysts to capture business requirements, enable a better understanding of business processes, and facilitate communication between business process analysts and IT experts, who are often involved with the scope to monitor automate process activities [1]. Designing and implementation of a new model is really complex, consumes so much time, and is error-prone. It requires extensive knowledge to understand company's operation and business rules perfectly. Because of this developing efficient business process becomes more and more important.

Business processes are a collection of one or more activities performed following a predefined order to achieve an objective business goal, usually within the context of an organizational structure that defines functional roles or relationships. Furthermore, a process can be regarded as work activities organized in a specific order in time and space, with clearly identified inputs and outputs [2]. Briefly, processes can be addressed as a set of activities that connects each others with inputs and outputs.

The Business Process methodology to collect the data for modelling business processes has six stages [3]–[8]. According to the Business Process Management, the six stages are process identification, process discovery, process analysis, process redesign, process implementation, and process monitoring and controlling. In these six stages, process modelling is an important part of the process discovery stage. Many different methods and notations have been proposed to support these activities, such as object-oriented approaches based on UML class diagrams, and entity-relationships models [9], [10]. Several proposals are based on BPMN or UML activity diagrams [11]–[13]. Recently, the agent-based models and simulations (ABMSs) have been employed in business processes modelling [14]. Indeed, agent-based models are increasingly being used to study and examine several transportation issues, which range from traffic flow to air traffic control [15]. According to [16] and others, the ABM approach seems very promising for simulating stakeholder interactions such as in a seaport environment. In an ABM, different agents have different roles and also individual goals. The use of agents representing the different actors permits to compare several solutions for making the best use of the resources in the total port operations process. In this paper we pursue and extend this trend, by focusing on an entirely topic: planning and management of ports. The execution of the ABM allows to investigate patterns that are interesting for analysis. Emerging behaviours of the several agents modelled at a micro level and than simulated on a macro level permit to understand the complex interactions of the modelled agents. This understanding contributes to a more structured approach on stakeholder

relations management. Furthermore ABM allows the entities to communicate and allow researchers to study the behaviour under complexity. In particular, we build an agent-based model of the port of Genoa, using its futures in structural terms.

Agent-based modelling (ABM), already employed for the study of complex systems, such as financial markets [17]–[19], economic systems [20]–[24] and materials' properties [25], is an alternative approach able to address processes with a large number of units.

In this paper, the agent-based model and simulations of the import process of goods is presented. As a reference case the port of Genoa has been considered. The import processes of goods has been modelled considering the agents' behaviour and the documentation necessary. In particular, for modelling the import process of goods the following agents have been defined: the Agent Maritime, the Customs, the Custom Clearance Agent, the Delivery Service, the Deliverer, the Terminal, the Finance Police, the Gate and the Terminal Area. The agents communicate among each others by means of messages and simulating the real processes, for example sending the goods, accepting or rejecting them, planning the transport. The agent-based tool chosen is Flexible Large-scale Agent Modelling Environment² (FLAME) that is an high-level modelling language. The FLAME provides a tool to develop agent-based models that can be run on High Performance computers. Models are created based upon a model of computation called (extended finite) state machines. The paper is organized as follows: Section II presents the description of the port of Genoa, Section III the model, Section IV shows the computational experiments and the discussion of results. Finally, Section V provides the conclusion of the study.

The port of genoa

The port operators are the terminal operators that receive a concession by the Port authority to manage the trade of goods of the ships that dock at the port, engaging services of their own personnel. Among the operators there are also those that provide services docks (integration of the cycle, cargo handling, warehousing, consolidation) to particular port terminal operators, even if they have not a concession of docks. There is many port operators that contribute to complete a port process. In particular, a portion of them belongs to the "seafarer", having titles and qualifications to achieve several tasks for which special safety profiles of navigation are necessary, i.e., maritime workers, the pilots of the port, the boatmen, the staff of the Port-Coast Guard, whereas another portion belongs to the Public Administration, i.e. Capitaneria di porto, workers of "Autorit portuale", "Agenzia delle Dogane", "Guardia di Finanza", "Sanit marittima e Veterinaria", "Polizia di frontiera marittima", "Vigili del Fuoco", "ARPAL", "ASL". The category of the "port employees", i.e. directors, business, information technology, management, selection and training of personnel, the operators both on the ship and on the yard and gate, conduct activities related to the planning, scheduling, control, coordination, execution and maintenance. The workers, belonging to the category of shipping agencies, act for the ship in transit. Finally, the forwarding

agents represent the goods in transit and follow them during the journey from sender to receiver and coordinate port relationship with shipping companies, terminal operators, the ground transportation, customs.

The model

In general the development of a typical agent-based model consists in four steps. First, the identification of some real-world streamlined phenomena of interest that the modeller wants to explain. Second, the model is described by means of the time-line of the events, the micro level dynamic equations which include the individual agents behaviour, the set of parameters, and the set of random disturbances. Third, the models output is compared with the observations gathered from real world datasets. Fourth, the model is used to perform scenario analysis by modifying some of the behavioural equations or some of the parameters. In this section, the model description of the port is presented. We built the model using the features of the Genoa port in structural terms. We consider the stakeholders of the Genoa port and their mutual interactions, using the real network and the real data related to the processing of the documents exchanged among various actors (agents) included in the model. The information about actual Genoa port stakeholders and effective dynamics has been provided by the main companies involved in the port activities within the GESTEC project³. The port model includes the following agent types: the Agent Maritime, the Customs, the Custom Clearance Agent, the Delivery Service, the Deliverer, the Terminal, the Finance Police, the Gate, the Terminal Area. Fig. 1 shows a graphical representation of the present port model in terms of agent classes (ellipses) and documents exchange flows (arrows).

Each agent type is defined by its predetermined actions which are induced assigning specific states and sets of functional attributes, properties, or rules by means of predefined parameters. Hereafter, we describe briefly the duties performed by the port operators (agents) involved in the port model.

A. Agent Maritime (AM)

Agent Maritime is the actor responsible of the incoming goods. He follows the declaration process of the goods/products. He interacts with the customs by means of the Entry Summary Declaration (ENS) and the “Manifesto merci in arrivo” (MMA) documents, and with the custom clearing agent by means of the Delivery Order (DO). The ENS is a document that informs the Customs about the incoming goods, whereas the MMA is a document with the complete list of goods. In particular, MMA identifies each container embarked in the ship and includes information about the name of the ship, the port of arrival, the time of arrival. DO is a document necessary for entering in the port and picking up the goods.

B. Customs (C)

Customs checks if the imported products are conformed with the European and/or National laws. Operatively, Customs assigns an identification number to all the imported goods, that are collected in the Movement Reference Number

(MRN) document. Moreover, the MRN contains information for export or transit. Customs interacts with the Customs Clearance Agent by means of the Customs Entry (A3) and the Clear Code (CC) document. The A3 document contains all the relevant information related to the goods such as date, weight and packages, whereas CC contains the allowed clearance.

C. Customs Clearance Agent (CCA)

Customs Clearance Agent (CCA) is responsible for preparing the documentation and arranging the pick of the imported goods. CCA interacts with the Customs by means of the A3, the Customs Declaration (CD) and the CC documents. CD is a form, required by C, compiled by CCA that declares the value of the imported goods. Moreover, CCA interacts with the Delivery Service to organized the pick up of goods and with Gate for the leaving process by means of the leaving documentation, i.e. all the relevant documents necessary to leave the terminal area.

D. Delivery Service (DS)

Delivery Service agent (DS) is responsible for managing the transportation requests. DS interacts with the CCA receiving the request of transport and with the deliverer agent arranging the transportation by means of the Order of Transport (OT). OT is a document that indicates when it is possible to pickup the goods from the terminal area. It is also required in the picking up process.

E. Deliverer (D)

Deliverer Agent interacts with DS compiling the OT document. Moreover, D interacts with Gate agent by means of all the leaving documentation. Finally, D interacts with the terminal agents to get the permission to enter the terminal and with the terminal area agent to arrange the pick up.

F. Terminal (T)

Terminal interacts with the CCA for allowing or not the pick up of the goods, according to the presented documents, i.e., Delivery Order and Security Clearance. If they are correct and there are no legal problems in the presented documentation the authorization is given. Moreover, T interacts with D and the terminal area agent to organize the picking up.

G. Finance Police (FP)

Finance Police Agent has the task of checking the containers and preventing smuggling or trade of illegal, counterfeit or dangerous goods. In order to authorize the purchase or the pick up of the goods, the Finance Police Agent grants the Security Clearance (SC) document and sends it the Gate Agent. The Security Clearance is a document produced by the Finance Police that guarantees that everything is legal.

H. Gate (G)

Gate agent is responsible for exit permission of the goods. G sends D the exit permission documents, i.e., the leaving documentation, received by CCA, with the date for getting the goods and SC document, received by FP.

I. Terminal Area (TA)

Terminal Area agent is the place where the goods are, waiting the pick up. TA interacts with the T confirming the loading operations.

Import process

The beginning of the process is the arrival of a ship. In fact, when the ship arrives, the Agent Maritime sends the Entry Summary Declaration (ENS) to the Customs. It is worth remarking that the Entry Summary Declaration is a document that informs the Customs about the incoming goods. The Customs, received the ENS document, assigns a code to each good and assembles all the code in the MRN document and sends it back to the Agent Maritime. The Agent Maritime, received the MRN document, sends the MMA document to the Customs and the DO document to the Custom Clearance Agent, respectively. The Customs, received the MMA, sends the A3 document to the Custom Clearance Agent, that, received the A3 document, sends the Customs the Customs Declaration (CD) and contacts the Terminal in order to arrange the book for picking up the goods. The Customs, received the compiled Declaration Form, elaborates it and if there are no errors it allows the clearance and sends back to the Custom Clearance Agent the Clear Code (CC). It is worth noting that the Clear Code is a document that allows to pick up the goods from the Terminal Area. The Custom Clearance Agent, received the Clear Code (CC) from the Customs, the Delivery Order from the Agent Maritime and if the terminal allows the picking up of the goods, contacts the Delivery Service to arrange the transportation. The Delivery Service, in turn, contacts the Deliverer sending the Order of Transport (OT).

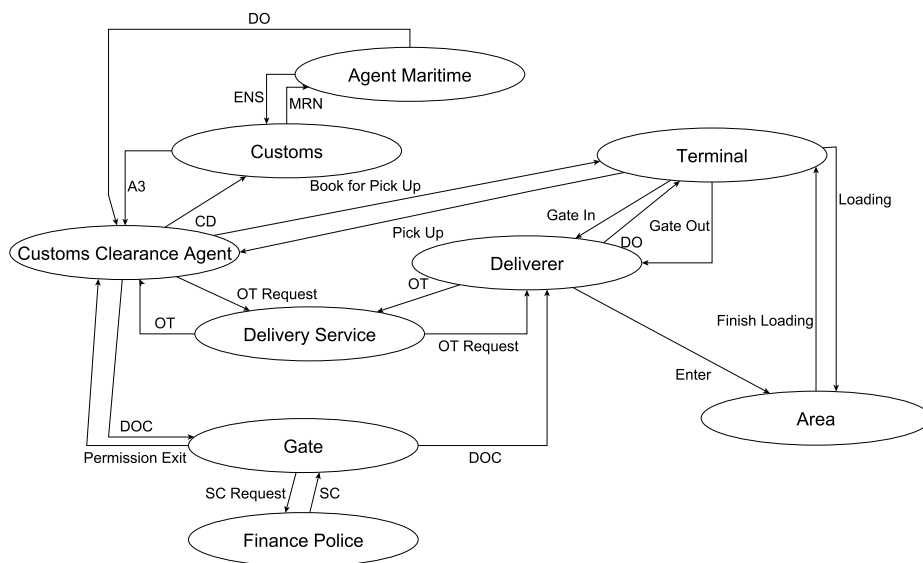


Figure 19: Graphical representation of the harbour model in terms of agent classes (ellipses) and documents exchange (arrows).

The Deliverer confirms to the Delivery Service the transportation using the Order of Transport document, compiled with the delivery time. The Delivery service gives to the Custom Clearance Agent the confirmation of the Deliverer agent sending the compiled OT. The Customs Clearance Agent, received the Order of Transport sends all the documents to the Gate agent in order to arrange

the exit process. The Gate, received all the leaving documentation, checks that everything is correct and if so, contacts the Customs Clearance Agent to inform him that it is possible to exit from the gate. The Custom Clearance Agent, received the permission to exit, book a date to exit from the Gate agent. The Gate agent can accept or change the proposed date and if accepted, sends all the leaving documentation approved and the date to exit to the Deliverer agent. Moreover, Gate agent requires the Security Clearance (SC) document to the Finance Police. It is worth remarking that the Security Clearance is a document produced by the Finance Police that guarantees that everything is legal. If all the documentation is correct, the Finance Policy sends the Security Clearance (SC) to the Gate, that sends it to the Deliverer. In the meantime the Deliverer requests access to the Terminal sending the delivery order. The terminal elaborates the request and if everything is right he allows the Deliverer to gate in. The Deliverer, received the gate in permission from the terminal and the Security Clearance from the gate enters in the terminal area for the loading process. The Terminal after the operations of search for goods and loading of them gives the Deliverer the permission to leave the Terminal.

Computational experiments

The model developed was validated by means of the technique named as face validity that involves domain experts. Through this method the judgment about the accuracy of the model is subjective. In fact, based on experience, we can say if the model behaves reasonably. In fact, a way for expressing a correct judgment consists to follow the agents properties viewing on a display the behaviour of the model over time (animation method). In all simulations, the number of iterations is equal to 800 (i.e., more or less 13 hours of business activity). The time range necessary to prepare each document, defined in Section III, is described in Table 19. The data have been supplied by Hub Telematica. In each simulation the time necessary to prepare the documents is chosen randomly between the values in the range.

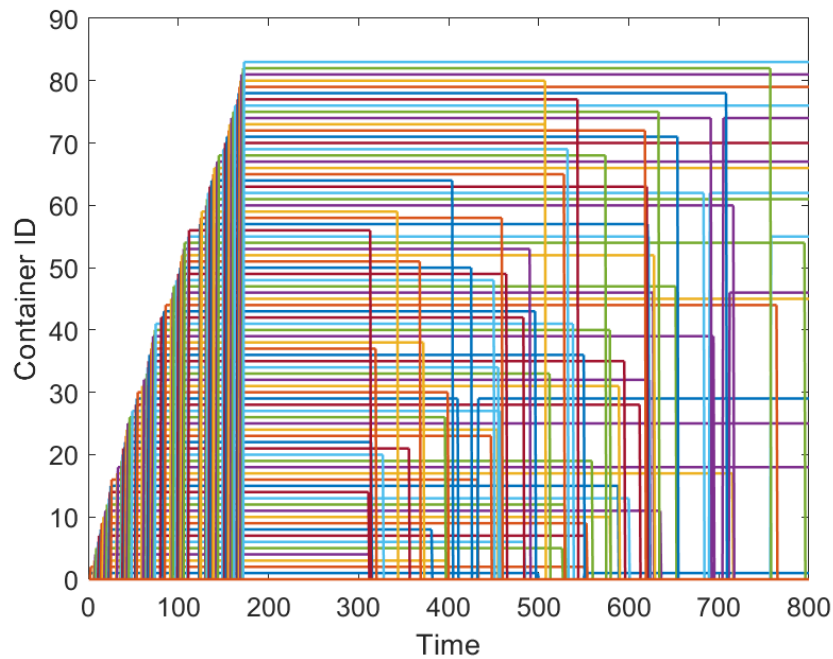


Figure 20: The first 84 containers' arrival and exit time from the port system in scenario (i).

Two different situations are considered:

- (a) the containers imported are immediately processed (scenario (i))
- (b) the containers imported have some delay in the import process (scenario (ii)).

In scenario (i) at each iteration step the maximum number of arriving container is one, i.e. at each iteration step the number of containers arriving is zero or one, whereas in scenario (ii) the maximum number of arriving container is two, i.e. at each iteration step the number of container arriving is zero, one or two. Figure 20 illustrates the first 84 containers' arrival and exit time from the port system in scenario (i). It is worth noting that the time for processing a containers from its arrival in the port to its leaving changes showing that if some documents are not ready or are delivered later, the process is blocked. In the figure, only 84 containers have been considered so that also the exit time can be seen. Figure 21 shows the time spent at the port by the first 84 containers plotted in Figure 20, showing that the values confirm the right implementation of the model, according to the time ranges provided in Table 19. Figure 20 Figure 21 can be done also for scenario (ii), but for the sake of compactness they are not shown in the paper.

Figure 4 show the number of container contemporaneously presented in the Terminal agent in scenario (i) and (ii). In both scenarios, after a transient situation, where the number of container increases more or less linearly, the regime is received. In the regime the number of containers is varying. It is worth noting that the time employed to process a container differs for each container bringing the oscillatory behaviour in the regime part. Comparing the transient part in scenario(i) and scenario(ii), it is worth noting that in scenario (ii) the ramp is steeper because of more container arrive in the same time and the regime is

reached faster.

The Figure 22 shows the number of container in queue in the Customs agent in scenario (i) and in scenario(ii), respectively. In the case of scenario (i), red cross line, the number is always equal to zero, as when a container arrives the Customs is ready to process it, whereas in scenario (ii), blue dotted line, if two containers arrive at the same time only one container can be processes and the other is added in the queue. In the simulation performed, the queue is managed according to the First In First Out (FIFO) logic.

It is worth remembering that in scenario (i) there are no container in the queue, whereas in scenario (ii), as the logic used is FIFO the curve is an ascending straight line, as shown in Figure 23. Thus, the import process of goods implemented works and let to investigate the main bottlenecks of the system. In fact, the two situations tested helps us to consider different what-if scenarios and to understand the level of criticality of the network and the nodes and where the mechanism does not work, generating bottlenecks.

Table 19: Time range of variables used in the model.

Symbol	Description	Range	Unit
ENS	Entry Summary Declaration	[0,1]	-
MMA	Manifesto Merci in Arrivo	[2,40]	m
DO	Delivery Order	[15,240]	m
CDtime	Custom Declaration Time	[1,40]	m
OTtime	Ordine di Trasporto	[5,60]	m
GATEINtime	Time needed for container to enter to Terminal	[120,480]	m
NOtime	Time needed to produce Nulla Osta	[5,240]	m
PICKUPtime	Time needed to authorize withdrawal	[5,60]	m

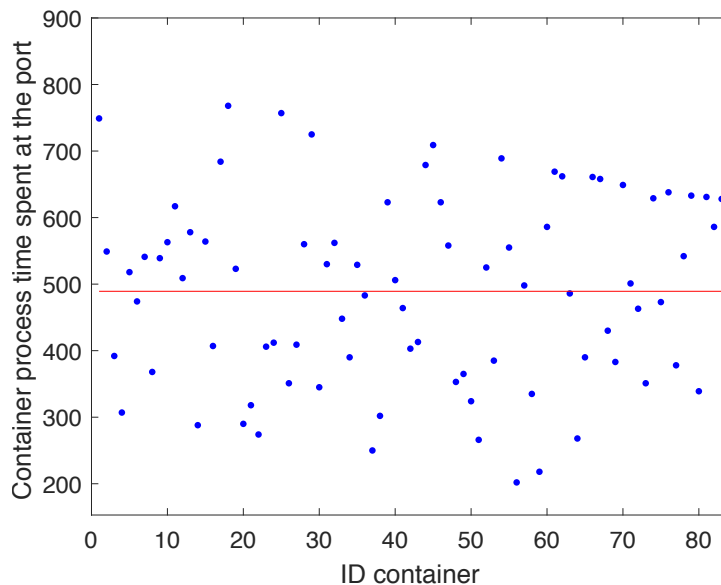


Figure 21: The blue dots represent the time spent at the port by the first 84 containers in scenario (i). The red line represents the average time.

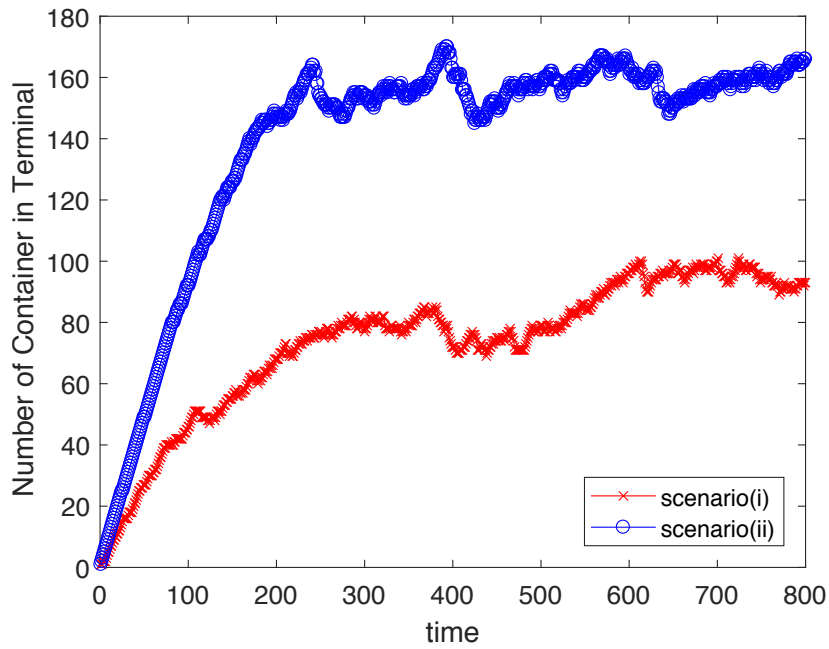


Figure 22: The number of container contemporaneously presented in the Terminal agent in the case of scenario (i), in red, in and in scenario (ii), in blue, respectively.

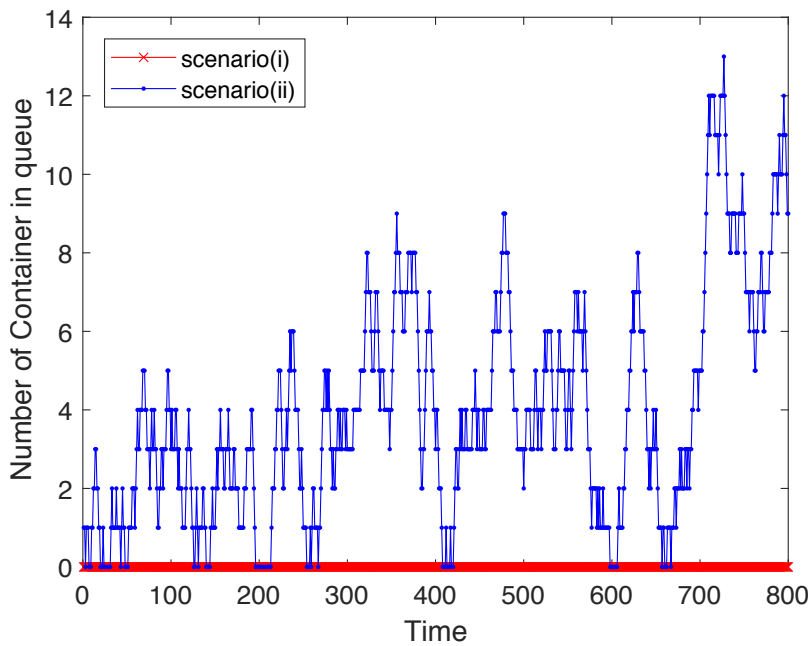


Figure 23: Number in queue in the Customs agent in case of scenario (i) and (ii).

Conclusions

This work describes research investigating the applicability of ABMSs in supporting operational management of port traffics to improve the performance of the whole port system. The import process of the goods has

been modelled and implemented for simulating the management processes in order to identify local practices made by the different actors involved in the activities. The computational environment developed has been tested with the real case of the port of Genoa. The model chosen for the study falls into the category of agent-based models which are very suitable for simulating complex systems where a large number of heterogeneous agents or entities with specific features interact among each other in order to establish relationships. Agents based modeling has enabled us to investigate the dynamics of the Port of Genoa and its macroscopic behaviour starting from the micro-level properties, constraints and rules assigned to selected agents. Furthermore, agent-based modelling has been used to study pragmatic solutions to problems related to business processes. The software chosen for the implementation is FLAME.

The business case of the port of Genoa has been tested modelling the time documentation according to the specification of the Genoa case.

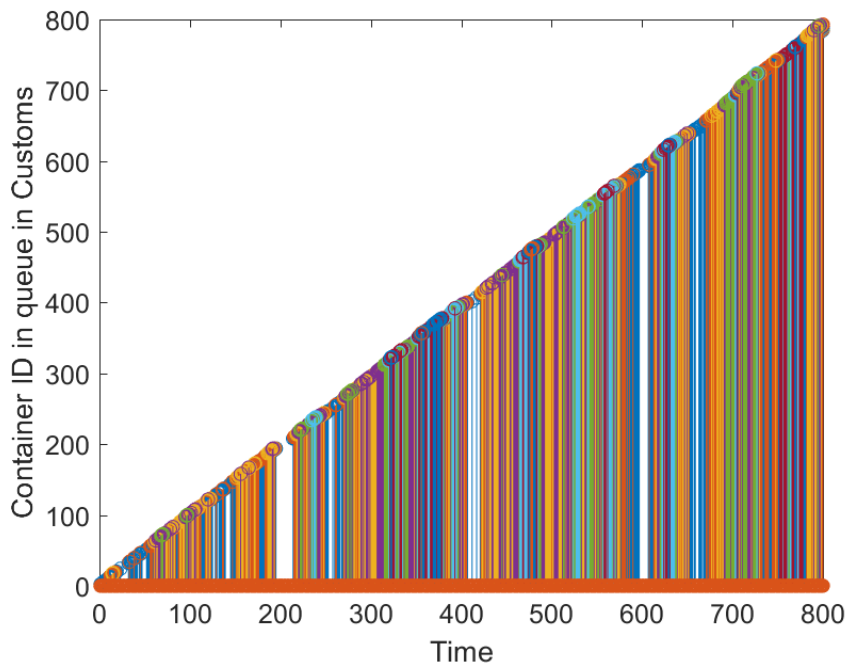


Figure 24: Sequence of container in the Customs queue.

Results have shown that the mechanism implemented simulates the actual process. Moreover some bottlenecks have been discovered, such as delays to the handling of the containers and queues formation due to missing documentation or documentation with errors or not ready. Thus, the next step will be to use the implemented simulator to perform computational experiments that help to investigate and find solution for these and other possible bottlenecks in the import process, following the

behaviour of the single container. Furthermore, containers with different priority will be implemented, considering the case of dangerous goods or perishable goods. Finally, also different techniques for the model's validation will be considered. If the empirical data, i.e. data about the flux of containers, will be available, than, for example, the sensitivity analysis will be considered.

The main contribution of the work concerns a simulation tool for evaluating management policies in activities flow of a port. In fact the model of the port community and its assets is populated by many agents (stakeholders) that have individual goals (set of functions that are specified). The trade-offs found at a specified state can be changed through simulation experiments. The set or ranges of parameters can be evaluated while the simulation permits to compare several alternatives, i.e. supporting stakeholder relations management. We have presented the initial steps in developing an ABMS of the import process of goods in the port of Genoa. The goal is to develop an ABMS that can be used for evaluating policies for port terminal systems from stakeholders views. The concepts underlying the model can also be used to analyse relations of actors involved on a broader scale, i.e. the port hinterland. As such the FLAME provides an effective tool to structure stakeholder relations and as such is helpful when developing a more structured stakeholder relations management. The ABM developed would be the basis for a decision-support system. The results of the simulation are not an optimum policy solution, but provide to the decision makers the capacity to view the structure of a port system and the functions that the actors involved have based on several "what if" analyses.

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